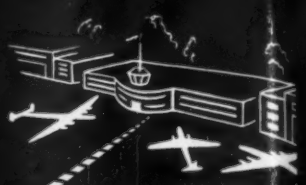
AUGUST 2, 1945

American Machinist

Powder Metals for Postwar

NEW APPLICATIONS OPENED BY WARTIME DEVELOPMENTS

AUTOMATIC PILOT



for YOUR Internal Grinding Operations

With the Heald Gage-Matic Internal, Hole Sizes are Checked FOR Not BY Your Operators

Nothing wrong with hand plugging in grinding holes to size—except that it's slow and subject to the human element. And that means chances for costly errors that often result in spoilage and rejects. But, let a Heald Gage-Matic Internal take over, and you automatically banish such handicaps. You get all the advantages of a solid plug and in addition get faster, better, more profitable production.

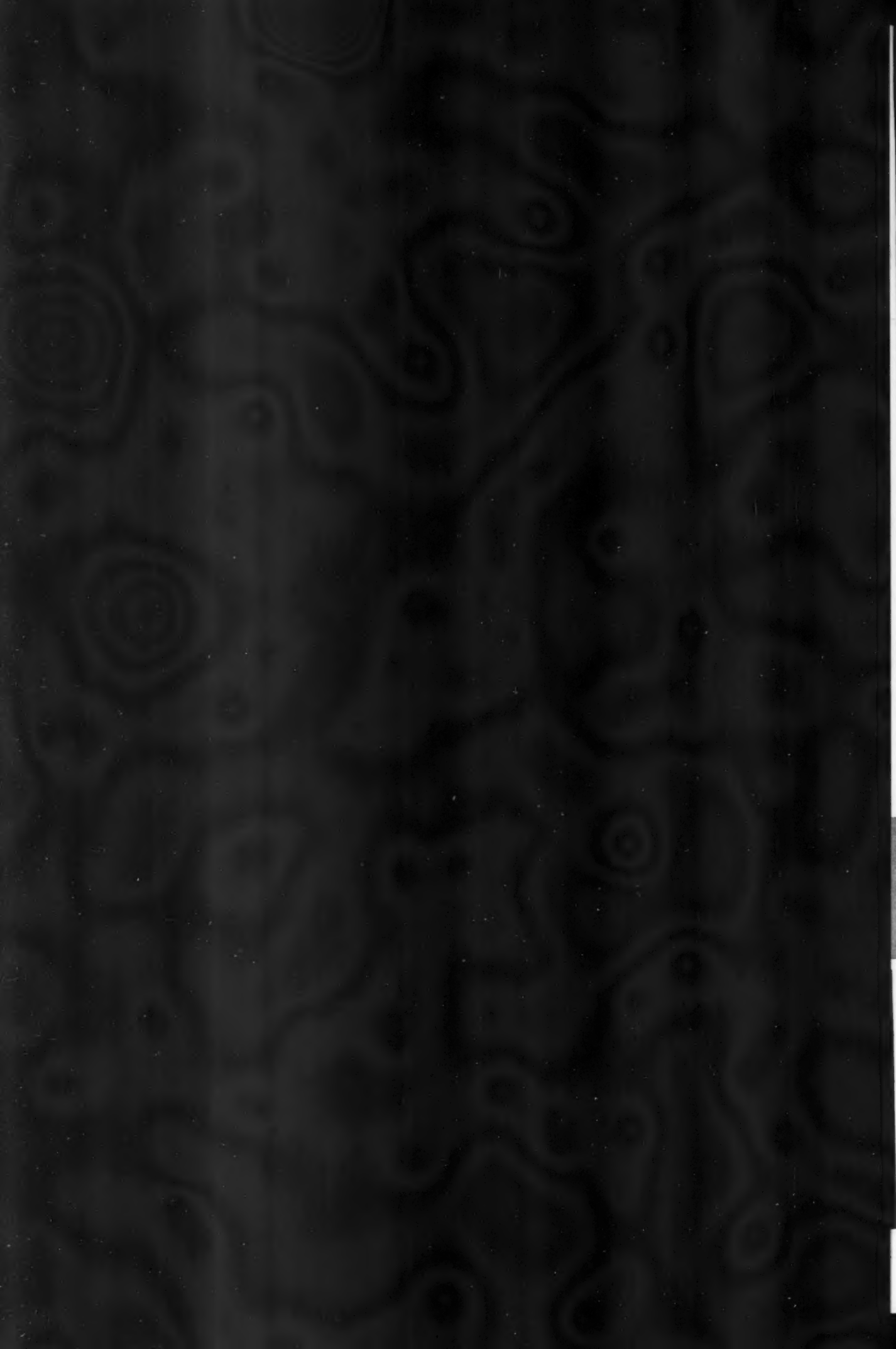
Here's how Gage-Matic works: a set of solid, positive sizing gage-plugs attempt to enter the back of the hole with each pass of the wheel. When the roughing gage enters, the wheel is trued and grinding resumed. The instant the finish-size gage plug is able to enter the hole, your Gage-Matic automatically goes to rest position. Not a chance for oversize and scrap! Remember too, the Gage-Matic does this automatic checking of your work at split second intervals—regardless of minor irregularities in wheel wear; amount of stock; hardness or length of part; size of hole. Uniform accuracy is assured and tolerances to the closest limits are maintained. All your operator has to do is to load the work and throw the starting lever.

The Gage-Matic puts to work a principle well-proved by more than 15 years of successful use. Why not take advantage of Heald experience and ask a Heald Engineer to come in with facts that mean profits for you? No obligation.

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

More Precision · Less Cost **HEALD**

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES



American Machinist

August 2, 1945

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American Machinist Chips

(From whence it came we know not, but several weeks ago there drifted into ye office of American Machinist *a most toothsome morsel. It seemeth that a War Production Board Conservation Order was found lurking in a Washington desk, which shall remain unidentified. Attached was a manuscript of a play which, wethinks, might strike a responsive chord in the breasts of many readers good and true. Since the Order appeareth to provide the historical background for the drama, pertinent provisions of it are quoted herewith):*

"On and after December 15, 1942, no person shall accept delivery of or use any material produced from cocoa beans for any of the following purposes in connection with production for sale:

(I) Manufacturing chocolate shot.

(II) Manufacturing hollow-molded novelty items.

(III) Manufacturing solid chocolate novelty items.

(IV) Partially or wholly coating novelty items.

(V) Partially or wholly coating miniature candy pieces weighing, when coated, less than 1/60 of a pound, excepted all-nut (glazed or unglazed), all-peanut, or all-fruit (fresh, dried or preserved) pieces.

(VI) Applying chocolate decoration (other than stringing), by spray-gun, pastry-bag, or other methods, to chocolate-coated candy pieces.

For purposes of this subparagraph, "novelty item" means any candy piece manufactured in a special shape commemorating, symbolizing, or representing any holiday, event, person, animal, or object."

THE CHOCOLATE SOLDIER

An Elizabethan Tragedy

DRAMATIS PERSONAE

BOSS, President and Manager of Colossal Candy Company
EMELIA, His Secretary
BRAGANZIO, Head Chef
PEDRO, A Stringer
BELLPAESE, A Peanut Glazer
FIRST WAR PRODUCTION BOARD INVESTIGATOR
CANDY MAKERS, INVESTIGATORS, SALESMEN, ETC.

Scene: Office of *Boss*, President of Colossal Candy Co.

Time: The Present

(Enter Boss)

Boss:
Am I awake, or do my senses lie?
What means this unaccustom'd solitude?
No one awaits: I see no pressing queue
Of governmental agents seated here,
I find no snoopers from the O.P.A.
No Labor Board investigator sits,
No Wage and Hour men. Ha! Am I blind
That I perceive this morn no brief cas'd fiend
From out the bowels of that thrice damn'd place,
That vomiter of alphabets, that Washington?
'Tis strange, 'tis passing strange, and I foresee
That evil hours doubtless wait on me.

(Enter Emelia)

Emelia:
Good morrow, Boss!

Boss:
Good morrow, sweet Emelia
Tread lightly toward the desk that bears our mail:
Those teeming messages that flock our way
To pry into the marrow of our work
Seeking report upon our purchases,
Our sales, our inventories, and our costs,
Page upon page, demanding ink alone
Enough to dye the White House Stygian black!
For I foretell that ere Aurora's shafts
Have vaulted to the apex of the skies
A questionnaire will come from out the East
To cause our very hairs to leap their roots.

Emelia:
I fear it not, for I have come to this—
That filling out reports have caused my hands,
Actaeon-like, to turn from flesh to horn
So that I feel no pain.

(Enter Braganzio, Pedro and Bellpaese, excitedly)

Pedro:
Good sir, a word!

Boss:
Come, speak, thou cocoa-finger'd knaves,
Thou horrid portents of some unknown wrong!

Emelia:
We do beseech that you disgorge yourselves
Of foul tidings which we fear you bear.

Braganzio:
We bring you tragic news, sir, of an act
Performed on these very premises
So heinous that our lately prating tongues
Like tails on whipp'd and undernourish'd dogs
Refuse to wag.

Pedro:
Oh evil day!

Boss:
I knew
That this would come to pass. Quick, tell me all.
What act performed or what form unfil'd,
What order of the War Production Board
Has caused this scene of horror to unfold?

Braganzio:
(kneeling) Oh Sir!

Bellpaese:
If you will bear with me awhile
The tale will out. 'Tis this: At dawn today
We found, among the products of our craft,
Completely fabricated chocolate shot
Like vultures' droppings, full a score.

Braganzio:
Besides
In hollow mold and manufactur'd from
The tawny essence of the cocoa bean
A Santa Claus, three Peter Pans, and, worse,
A statue, made of solid chocolate,
The very mold and marked similitude
Of Button Gwinnett.

Emelia:
Boss, I die!
(Emelia dies, Hautboys without, enter three War Production Board investigators).

Boss:
Who are these men of dismal puss? (Aside Alas! Methinks
For weeks my factory has been their haunt.

First Investigator:
Adieu, good sir! A warning ere we go
We leave you to entrain for Washington
Bearing reports in form sextuplicate
Affix'd with exhibits. We have weigh'd
Each piece of candy coated in your mill.
Today we found among your novelties
One item, hidden slyly 'neath his friends,
The dusky villain of that sweet display,
A chocolate coated candy piece that weighed
One sixty-fifth out of a pound!

All:
God fend!

Boss:
And now I am undone. This sorry tale
Has put the cap and climax on my woe.
'Tis doubly bad. To think that I alone
Should bear the sole responsibility
Of losing this, our war. Let London fall,
Let Stalingrad, with all its stout men, go!
What moments it? Here is the bottleneck.
Triumph, Oh Hitler, for the end is near!
America's defense has cracked right here.
The war is lost, and I alone the cause,
I violated Donald Nelson's laws.
(Stabs himself with a chocolate icicle).

Braganzio:
God rest his soul, his crime is expiate,
Let us inter him as his death demands
Deep in a mass of Government reports
Of which we have supply to bury all of us.

(Exeunt, bearing body)

Curtain

Why Surface Harden Gear Teeth?

THE GLEASON ANSWER:

Burners and oxy-acetylene flames traversing tooth of a large spiral bevel pinion for a paper mill machine.

1. Maximum wear resistance with minimum distortion is produced by the Gleason localized hardening method, because each tooth is hardened individually, employing an oxy-acetylene flame and an air quench.

2. Uniform hardness for each tooth is attained by automatic operation of machines used.

3. The installation and operating cost is low. There is only one machine to buy, which, by use of simple, replaceable burner tips can handle a wide range of sizes and pitches of bevel, spur, and internal gears. Also, only a small supply of oxygen and acetylene is required.

4. Thousands of gears surface hardened by the Gleason method are in daily use. These range from small, instrument-type gears to large gun mount drives.

It should be noted, of course, that the initial core strength and mountings must be adequate.

GLEASON Works
Builders of BEVEL GEAR MACHINERY FOR OVER EIGHTY YEARS

For further information on the Gleason surface hardening method and machines, write on your company letterhead for descriptive bulletin "The Surface Hardening of Gear Teeth." The Gleason Works, Rochester 3, New York, U.S.A.

...hardening a lot of large spiral bevel gears for oil well machinery on the No. 2 Gear Surface Hardener.

THE CINCINNATI M

MILLING MACHINES

Operating a CINCINNATI No. 2 Cutter and Tool Grinder is actually as easy as it looks in the photograph on the opposite page, and one big reason is the super-sensitive, anti-friction table slide. You've no idea how easily the table moves until you try it yourself. It's as effortless as a twist of the wrist. And this easy table movement is assured whether you are grinding large or small, heavy or light cutters. It is especially desirable because it imposes less restrictions on physical capabilities. Furthermore, precision alignment is maintained regardless of the type or size of the job, because the anti-friction table ways are hardened and then ground in position. ¶ In addition to ease of operation, there are many other worth-while features. The complete story may be obtained by writing for Catalog M-962-3.

It's as Easy as it Looks!

CINCINNATI

Left: CINCINNATI'S *effortless table traverse is an important consideration to this operator, who, at the moment, is grinding the secondary clearance on a straight tooth side milling cutter. Catalog M-962-3 contains complete specifications for the No. 2 Cutter and Tool Grinder. A brief description may be found in Sweet's Catalog File for Mechanical Industries.*

KEEP YOUR PAYROLL ALLOTMENT FOR **WAR BONDS** UP TO **15%** OR MORE

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

you wouldn't

Nor would you put carbide cutting tools on a lathe lacking the fundamental rigidity for their use. Carbide tools have increased cutting speeds from 200 to 500 per cent. They require as much as 300 per cent more horsepower.

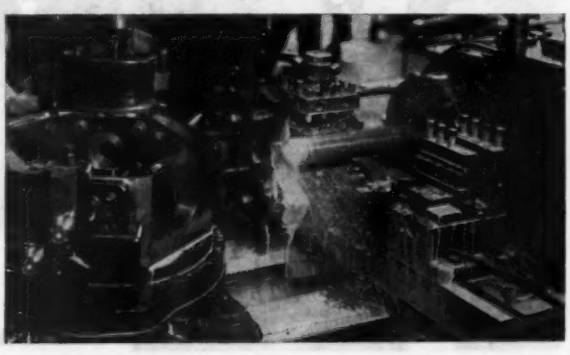
Modern Jones & Lamson Turret Lathes are designed specifically to carry this extra load, and more. They have the rigidity, they can transmit the power, they are easy to operate.

THE KEEN COMPETITION TO COME will make us all more cost-conscious than ever. Our jobs, and our earnings, as well as profits, will depend upon maximum production from the most efficient machines.

Now is the time to check your equipment. Plan now to scrap obsolete machines and replace them with good War Surplus machines or new machines. Our engineers will be glad to assist you.

What HORSEPOWER Are You Using?

This cut, on 2-inch bar stock, requires 300 per cent more horsepower with a carbide tipped tool than with a high speed steel tool, and Carbide halves the cutting time.

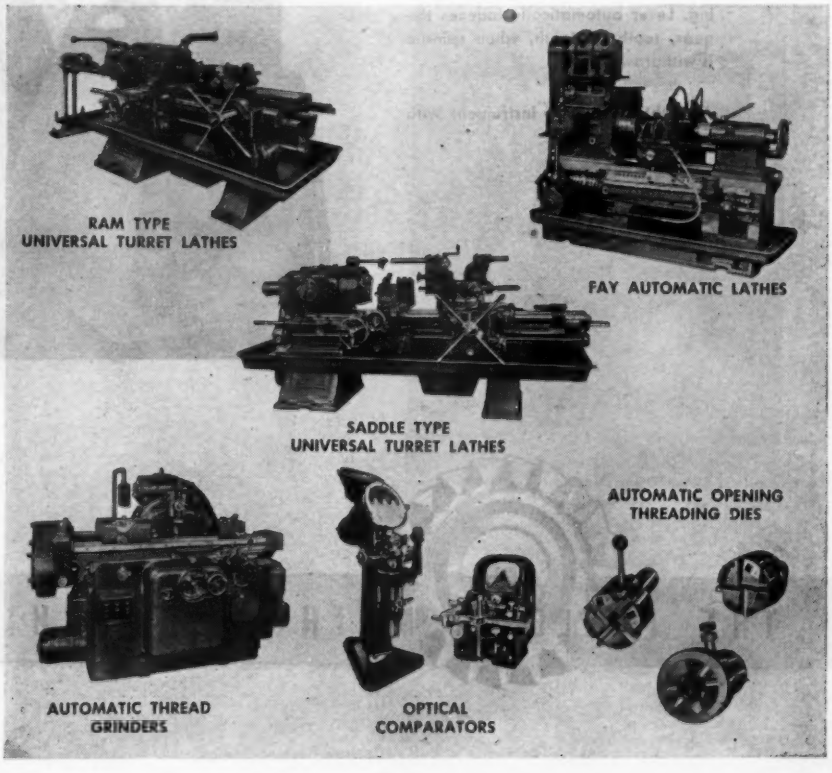


Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools

Turret Lathes

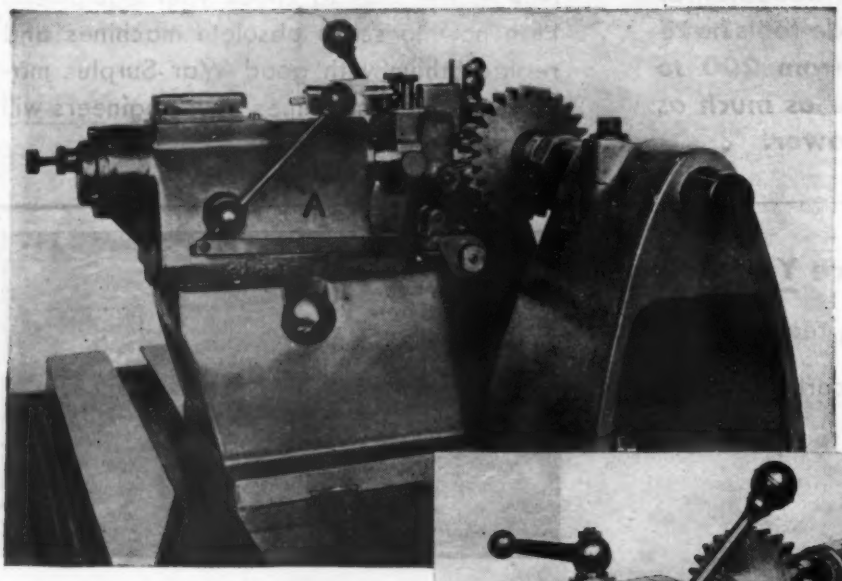
JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

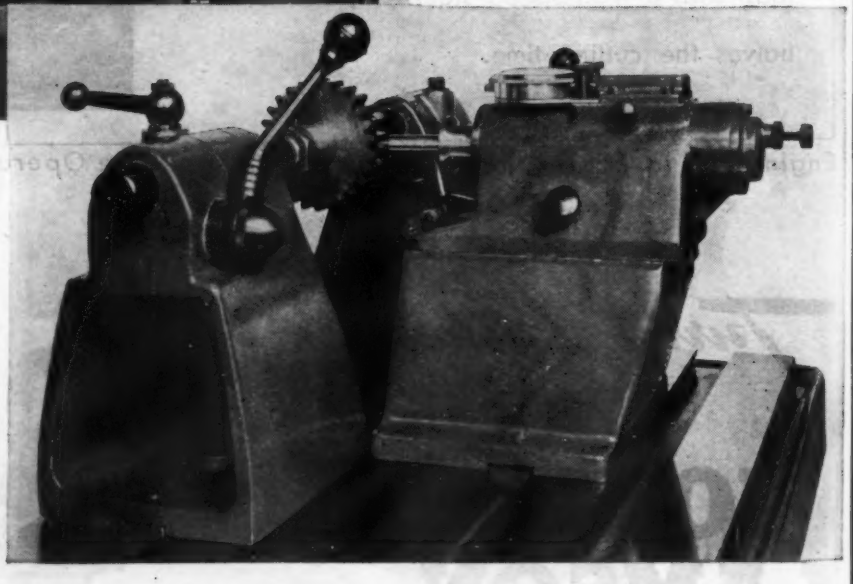
Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



Preshaving GEARIN

★ **Improved-Type Fellows Cone, Tooth Spacing and Taper Inspection Instruments Facilitate Checking**





Above: No. 12C Inspection Instrument set up for checking tooth spacing. Lever automatically indexes the gear, tooth by tooth, when spindle is withdrawn.

At right: The same instrument with Cone Point in use.

INSPECTION

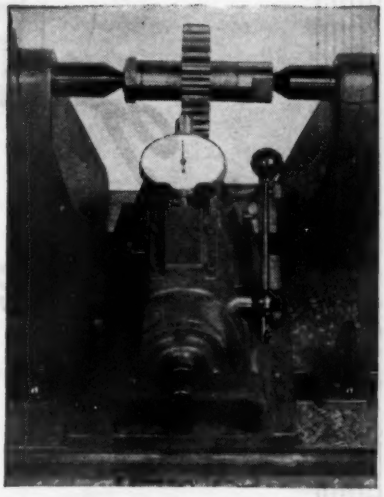
STILL FURTHER *simplified*

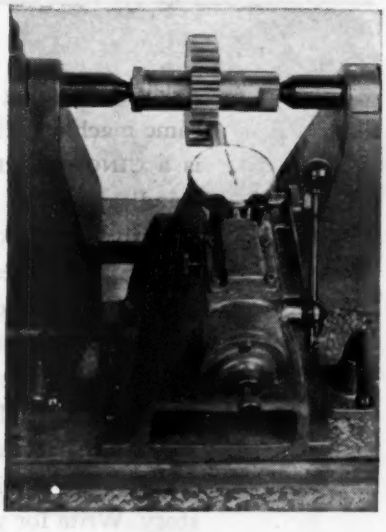
For ease of operation, and for speedy shift-over from one test to another, Fellows has incorporated in the new Nos. 12C and 12CT inspection instruments, illustrated here, quickly interchangeable cone points and tooth spacing checking units. The dial indicator which is graduated in tenths of a thousand, is used interchangeably with all three set-ups.

As shown in the illustrations on the opposite page, the spindle carrying the cone point or tooth spacing checking head, is operated by a lever A, and the return movement of this lever through the medium of an auxiliary mechanism, automatically indexes the gear. No. 12C is for cone and tooth spacing only, but No. 12CT is adapted to making all three checks: cone, tooth spacing and taper.

When checking taper on the No. 12CT instrument, the bracket carrying the cone pointer is moved along the bed by a hand wheel. Adjustable stops are provided for positioning the bracket, so that checks can be made at the same points in the face width of each gear.

For more details write for descriptive circular, to The Fellows Gear Shaper Company, Springfield, Vermont—or 640 West Town Office Bldg., Chicago 12, Ill. — or 616 Fisher Bldg., Detroit 2, Mich.





Above and below: No. 12CT Inspection Instrument showing Cone Point checking for taper of tooth.

Fellows

L OPERATIONS FROM BLANK TO FINISHED GEAR

No pampering of FILMATIC Bearings to get Fine Finishes!

CINCINNATI

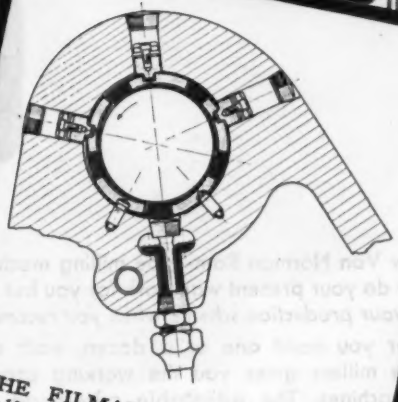
Ask any grinding man about the problems involved in roughing and finishing on the same machine. The chances are he will tell you that no problem exists if the grinder is a CINCINNATI with **FILMATIC** Bearings. But other types of grinding wheel spindle bearings usually involve a careful readjustment by an experienced man. ¶ With the introduction of **FILMATICS**, adjustment was eliminated, for you don't have to treat these bearings with kid gloves. Heavy roughing or fine finish grinding is all the same to CINCINNATI Grinders equipped with **FILMATIC** Bearings, for they require no adjustment whatever. These bearings are next to foolproof and demand no attention except periodic change of spindle oil. ¶ The fact that you don't need to pamper **FILMATIC** Bearings, regardless of the grade of finish desired, is still another reason why you should choose CINCINNATIS for your centerless or centertype grinding and lapping operations. Booklet G-446 contains the complete story. Write for your copy.

KEEP YOUR PAYROLL ALLOTMENT FOR
WAR BONDS
UP TO **15%** OR MORE

CINCINNATI

CENTER TYPE GRINDING MACHINES

This roll was rough and finish ground on a CINCINNATI Plain Self-Contained Grinder equipped with Swivel Table Type Roll Crowning Mechanism. Like all CINCINNATI Plain, Universal and Centerless Grinding Machines, the Plain Self-Contained Grinders are equipped with FILMATIC Bearings. Complete details may be obtained by writing for Catalog G-491-1. For a brief description look in Sweet's Catalog File for Mechanical Industries.



THE FILMATIC PRINCIPLE. *Self-adjusting shoes produce independent, converging oil films which develop high radial pressures, forcing spindle into central position and keeping it there. "The wedge-shaped oil film does the trick."*

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

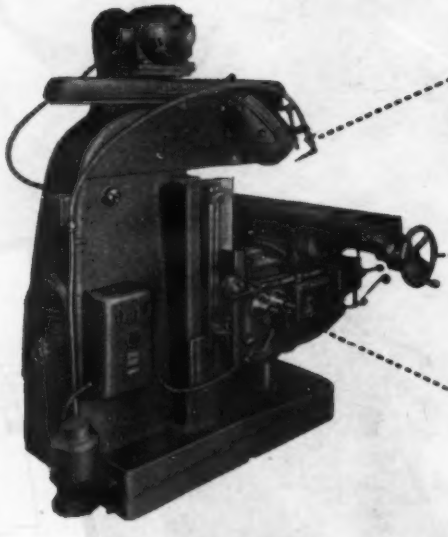
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Van Norman

RAM-TYPE

Milling Machines

Give Your Operators Every Advantage in Tool Room and General Purpose Milling



The new Van Norman Ram-Type milling machines will not only do your present war work for you but will also *fit into your production scheme when you reconvert.*

Whether you need one or a dozen, each of these versatile millers gives you the working capacity of three machines. The adjustable cutterhead enables your operator to do vertical, horizontal or angular milling. This means that work re-setups are minimized since most jobs can be carried through completion in the original setup.

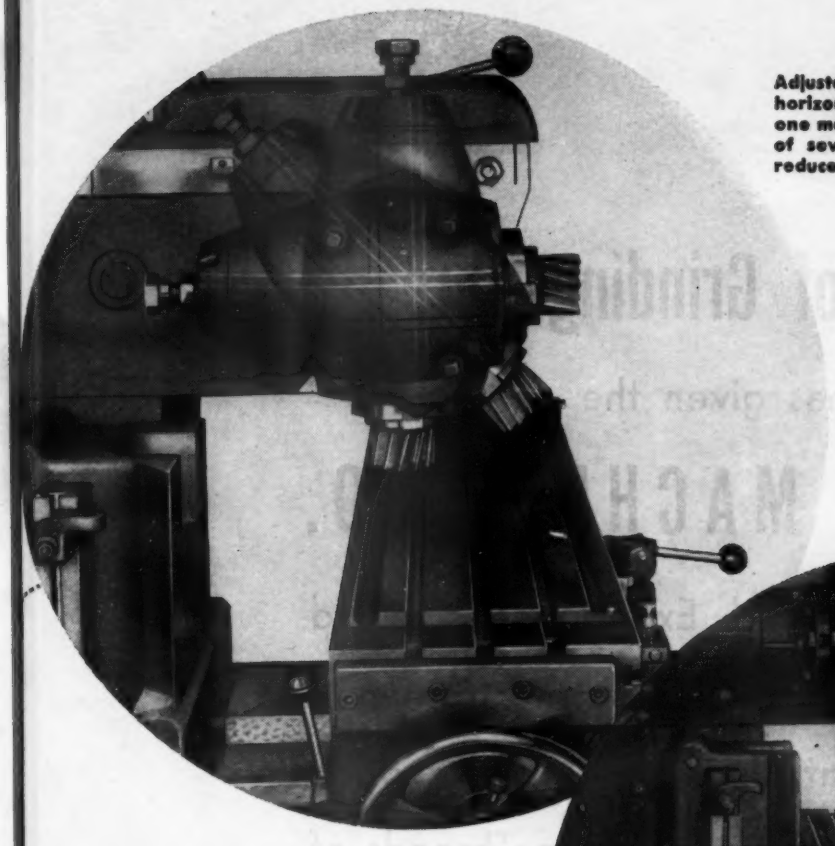
If most of your work is general purpose milling, then each day brings various types of milling work. One period mostly horizontal, another vertical, etc. This is when the Van Norman millers prove their worth because the adjustable cutterhead permits you to meet the fluctuating milling needs. It enables you to keep them operating continuously, saving you money by eliminating idle machine time so often encountered with single purpose machines.

In addition, such advantages as front and rear control of both manual and power feeds, directional control of all power feeds, single lever feed selector, sturdy column, base, table and knee assembly assure simplicity of operation, accuracy, and reduce rejects. Van Norman Ram-Type millers are available with plain or swivelling tables. Write for information.

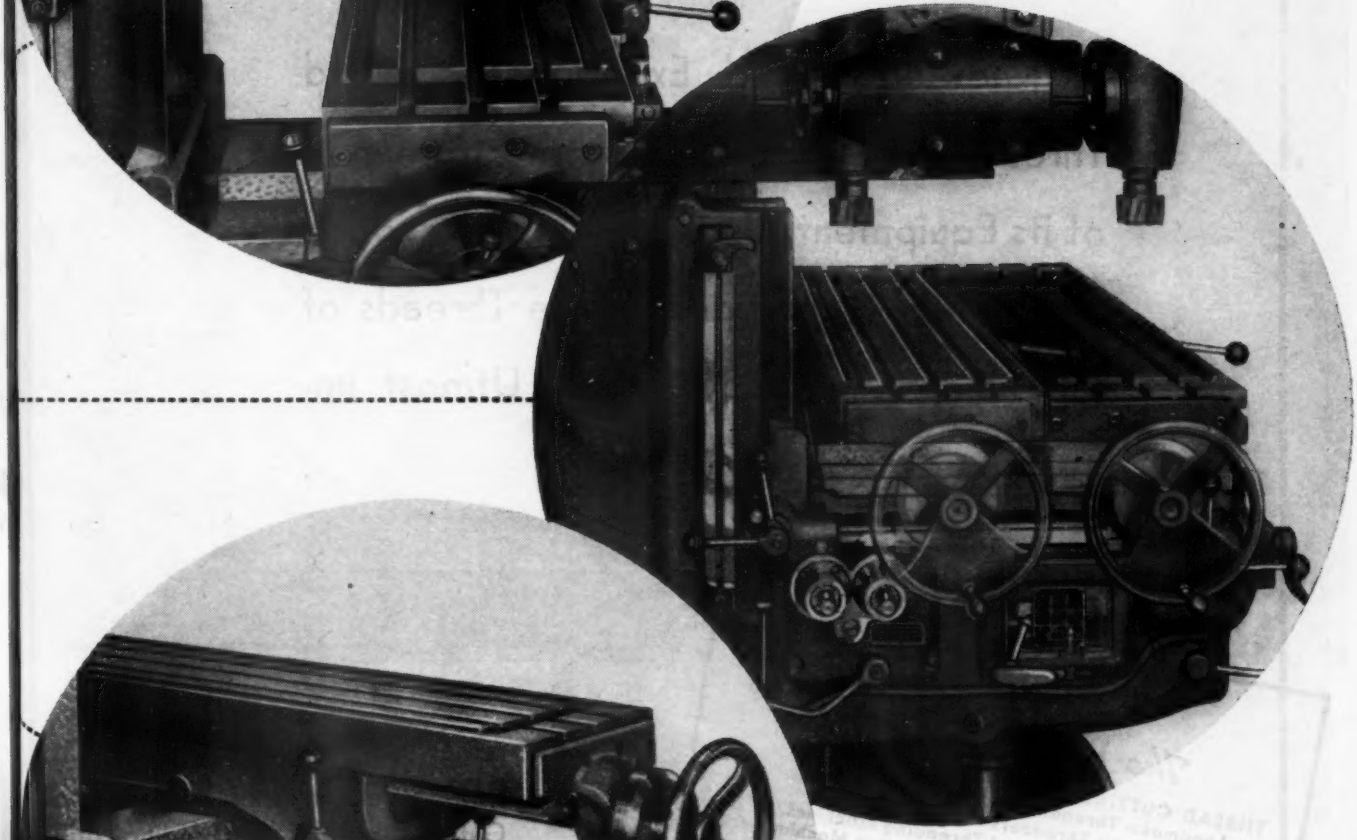
VAN NORMAN COMPANY

Springfield 7, Massachusetts

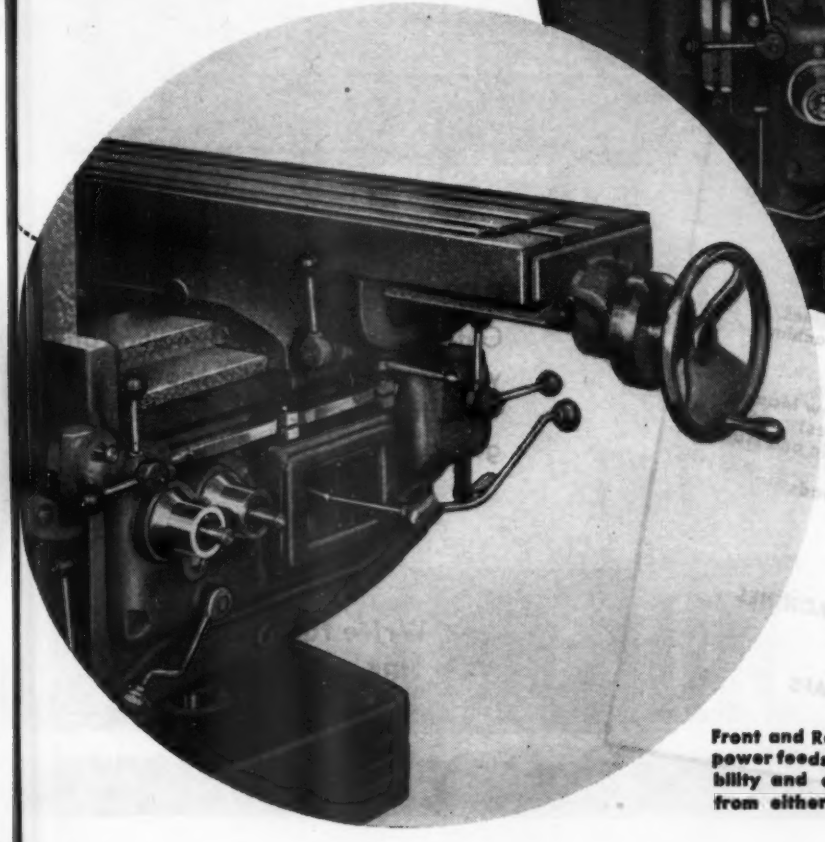
"It pays to Van Normanize"



Adjustable cutterhead permits vertical... horizontal . . . or angular milling all on one machine—gives you the work range of several types of millers . . . greatly reduces work reset-ups.



Adjustable cutterhead and movable ram, in combination with the saddle cross feed, provides maximum milling capacity and versatility.



Front and Rear control of both hand and power feeds gives operator complete visibility and control of milling operations from either location.

20 Years of Grinding Threads

has given the

LANDIS MACHINE CO.

A Knowledge and Experience Gained Through Day in and Day out Performance of its Equipment, Under the Most Exacting Production Conditions, where Threads of the Finest Accuracy are of Utmost Importance.

The LANDIS LINE

THREAD CUTTING MACHINES
Landmaco Threading Machines
Bolt Factory Threaders
Automatic Forming and Threading Machines
4 Spindle Semi-Automatic Threading Machines
Pipe and Nipple Threading Machines
THREAD CUTTING DIE HEADS
Landmatic (for Turret Lathes and Screw Machines)
Landex (for Automatic Screw Machines)
Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
Lanco Pipe and Nipple Threading Heads
Stationary Pipe Die Heads
Reverse Taper Die Heads
~~Standard Rotary Die Heads~~
PRECISION THREAD GRINDERS
PIPE THREADING AND CUTTING MACHINES
ROLLER PIPE CUTTERS
CHASER GRINDERS
COLLAPSIBLE AND ADJUSTABLE TAPS

Landis Engineers, because of their long experience in both Thread Cutting and Thread Grinding, offer you an over-all expert knowledge of Grinding Practice as applied to the generation of screw threads.

Write for the Booklet
"BE THREADWISE"

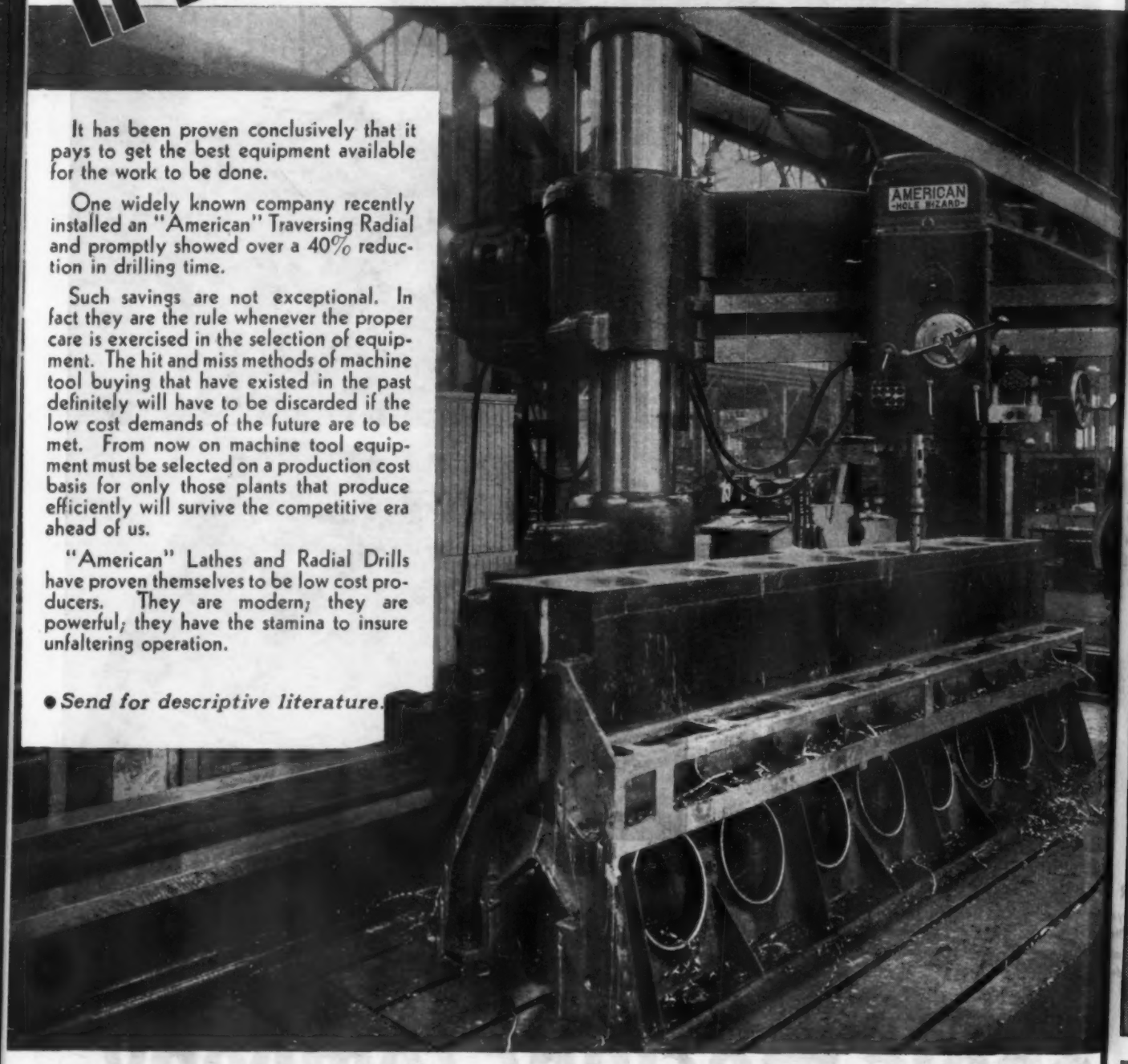
Landis No. 6 Precision Thread Grinder, grinding valve stems in the plant of a leading aircraft engine manufacturer.

LANDIS
REG. U.S. TRADE—MARK PAT. OFF.

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·

It PAYS to get the best



It has been proven conclusively that it pays to get the best equipment available for the work to be done.

One widely known company recently installed an "American" Traversing Radial and promptly showed over a 40% reduction in drilling time.

Such savings are not exceptional. In fact they are the rule whenever the proper care is exercised in the selection of equipment. The hit and miss methods of machine tool buying that have existed in the past definitely will have to be discarded if the low cost demands of the future are to be met. From now on machine tool equipment must be selected on a production cost basis for only those plants that produce efficiently will survive the competitive era ahead of us.

"American" Lathes and Radial Drills have proven themselves to be low cost producers. They are modern; they are powerful; they have the stamina to insure unfaltering operation.

● *Send for descriptive literature.*

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

LOOKING for TROUBLE!

Designed to stand up in trouble spots, America's newest and widest line of V-belts — Allis-Chalmers' Texrope — solves every one of these drive problems

I FIND MY PLACE WHERE EXPLOSION IS A DANGER. I'M SUPER-7 STATIC RESISTING; MY BUILT-IN CONDUCTING ELEMENT CARRIES CHARGES TO THE MACHINE WHERE THEY'RE GROUNDED!

I TAKE THE TOUGHEST OIL ASSIGNMENTS. I BATHE IN GRIMY LIQUIDS, AND DON'T MIND AT ALL. I'M SUPER-7 OIL-PROOF.. SOLID NEOPRENE!
A 1862

IT PAYS TO MAKE **ALLIS-CHALMERS** YOUR

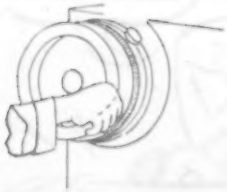
V-BELT DRIVE HEADQUARTERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

New BUILT-IN HYDRAULIC

4" TYPE H PLAIN HYDRAULIC GRINDER

- AUTOMATIC GRINDING CYCLES
- WHEEL RESET MECHANISM
- GROUPED ELECTRIC CONTROLS
- AUTOMATIC WORK ROTATION AND COOLANT FLOW CONTROL
- AMPLE LEG ROOM

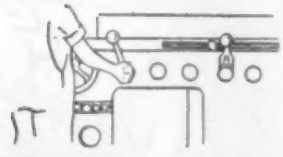


WHEEL RESET MECHANISM

for hydraulic straight infeed eliminates a very common cause of work spoilage. On the Landis Type H the wheel is automatically reset upon the conclusion of either grinding cycle, straight infeed or traverse.

ELECTRIC CONTROLS

are all conveniently grouped at the left-hand side of the bed. A master start button serves as a work jog. A master stop button provides extra safety. Conveniently located selector switches control coolant flow and work speed.



SMOOTH HYDRAULIC POWER

is provided by a hydraulic system powered by a direct connected motor driven oil pump. The machine base forms an oil reservoir, thus saving space and making possible more compact design of the unit.

LANDIS TOOL *Precision Grinders*

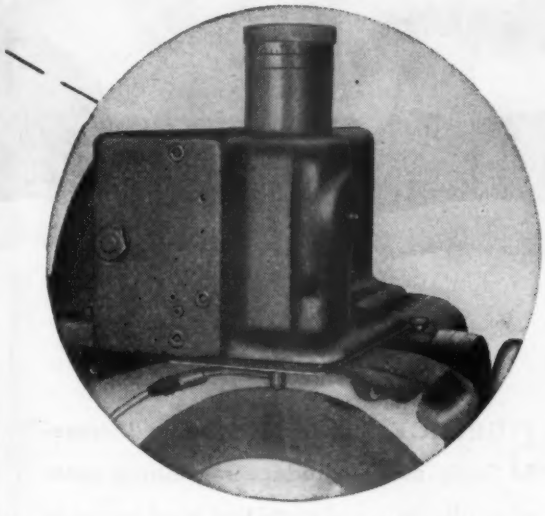
LANDIS TOOL COMPANY WA

WHEEL DRESSER . . .

Saves Production Time

Assures Superior Finishes

IN GRINDING SMALL PARTS



This view of the new Landis Built-In Hydraulic Wheel Dresser shows the diamond in dressing position, the method of directing coolant to the diamond, and the calibrated setting for fine grinding wheel face dressing.

For superior finishes and maximum production when grinding small parts, it's essential to have a free cutting face on the grinding wheel, and that the wheel remain concentric and parallel. However, the time necessary to break the setup and dress the grinding wheel can eat a big hole in your production schedule.

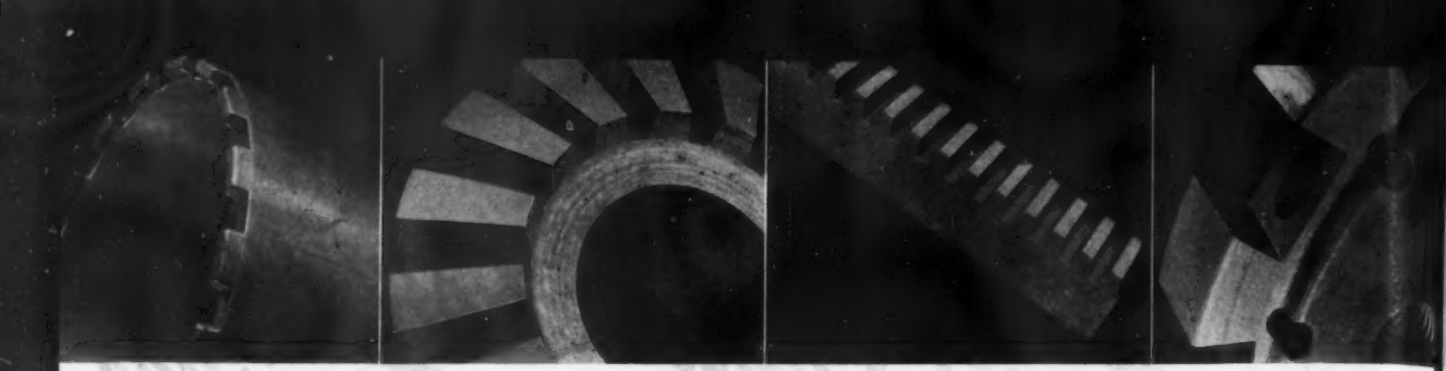
To speed grinding wheel dressing and maintain superior finishes, on the Landis 4" Type H Plain Hydraulic Grinder, a new built-in, hydraulic grinding wheel dresser can be supplied. It trues and dresses the wheel at one and the same time, without breaking the setup. All the operator does is set a dial and click a switch.

A cutting diamond traverses hydraulically across the face of the wheel and quickly sharpens it. In a matter of minutes the grinding wheel is "dressed" and true and the machine is ready for more work.

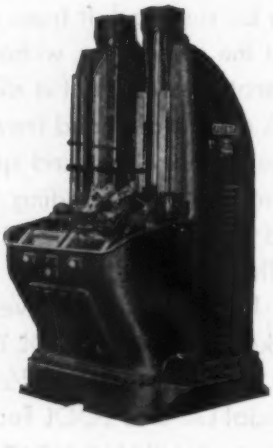
This wheel "dressing" unit is the latest addition to the long list of exclusive LANDIS TOOL features that make the LANDIS TOOL Type H so productive in turning out small parts up to 1½" with superior finishes. Other special LANDIS TOOL features of this grinding machine include, VARIABLE VOLTAGE HEADSTOCK DRIVE, MICROSPHERE WHEEL SPINDLE BEARINGS, ANNEALED CASTINGS AND DYNAMICALLY BALANCED PARTS. If you would like full details on this modern grinder, ask for your copy of Catalog A 44. 39

LANDIS TOOL Company

WAYNESBORO, PENNA.



for lower costs investigate *Surface Broaching*



SURFACE broaching is being increasingly used to reduce machining costs of duplicate metal parts that must be made in large quantities to close tolerances. In the automotive, aircraft, electrical appliance or small tool field there are many opportunities of applying surface broaching at remarkable savings over present methods. Due to the high production obtained (up to 2000 pieces per hour on many parts) direct labor costs are kept low, and because surface broaching cutting speeds are low (about 30 to 35 feet per minute) tool maintenance costs are kept at a minimum. It will pay to investigate Footburt surface broaching methods. Send us blueprints and information on production requirements.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

IOVE UP THE SCHEDULE

☆

VIN THE WAR QUICKER

Footburt Patented Tooth F

FOOTBURT *Surface Broaching*

Assembling and wiring a large ground station transmitter at Collins Radio Company, one of the many types of "Autotune" equipment that have made Collins a leader in the communications field.

Transmitting **PRODUCTION FACTS** for transmitter producers

Self-Charting **KARDEX** *co-ordinates* { FABRICATION / ROUTING / SCHEDULING } *for* **COLLINS RADIO CO.**

To coordinate plant operations and avoid waste of time, the Collins Radio Co. uses an ingenious Kardex *Visible* record that provides a single unified control for fabrication, routing and scheduling activities.

"Fabricated Parts Procurement Reports" are consolidated with the "In Process Transfer and Receipts Record" for fast, complete reference at one source. Colored Kardex marginal signals do triple work. The *color* itself indicates whether the part is for a minor assembly . . . also the department producing the assembly and the shop making the part itself. The *position* of the Graph-A-Matic signals (right) reveals quantities received in stock. Traveling against an insert on which is posted scheduled production by months, these signals form a vertical *chart* that instantly reveals to all concerned which parts are behind schedule.

"Kardex saves this department countless hours in analysing and preventing shortages," states A. N. Hollingsworth, superintendent. "It's easy to set up, simple to use and very fast in operation."

This record supplies the scheduling section with all needed facts for effective expediting. It gives the machine load section figures and finish dates for the operation of machine loads. Fabrication records section needs and uses the data to show work in process, work completed and to be completed.

For full details of effective operating records control, call our nearest Branch Office.

SYSTEMS DIVISION

REMINGTON RAND

315 Fourth Ave., New York 10, N. Y.

COPYRIGHT REMINGTON RAND INC.

Annual Costs		Average Life	
Tool steel gages	$15,600	Tool steel gages	4 hours
NORBIDE gages	100	NORBIDE gages	17 months*
Savings with NORBIDE gages	$15,500		

It's Simple Mathematics:

NORBIDE Gages { Subtract gage costs / Multiply gage life

The fact that NORBIDE Gages will outwear conventional types of gages a thousand times and will cut gage costs drastically has been demonstrated conclusively. A recent study made by the tool standards department of a large airplane parts plant showed that: tool steel plug gages wore out in four hours; chrome plated gages in eight hours, tungsten carbide gages in 14 days. A NORBIDE plug gage after five months use had worn less than .00001" and was estimated* to be accurate for another 12 months before wearing beyond the usable tolerance.

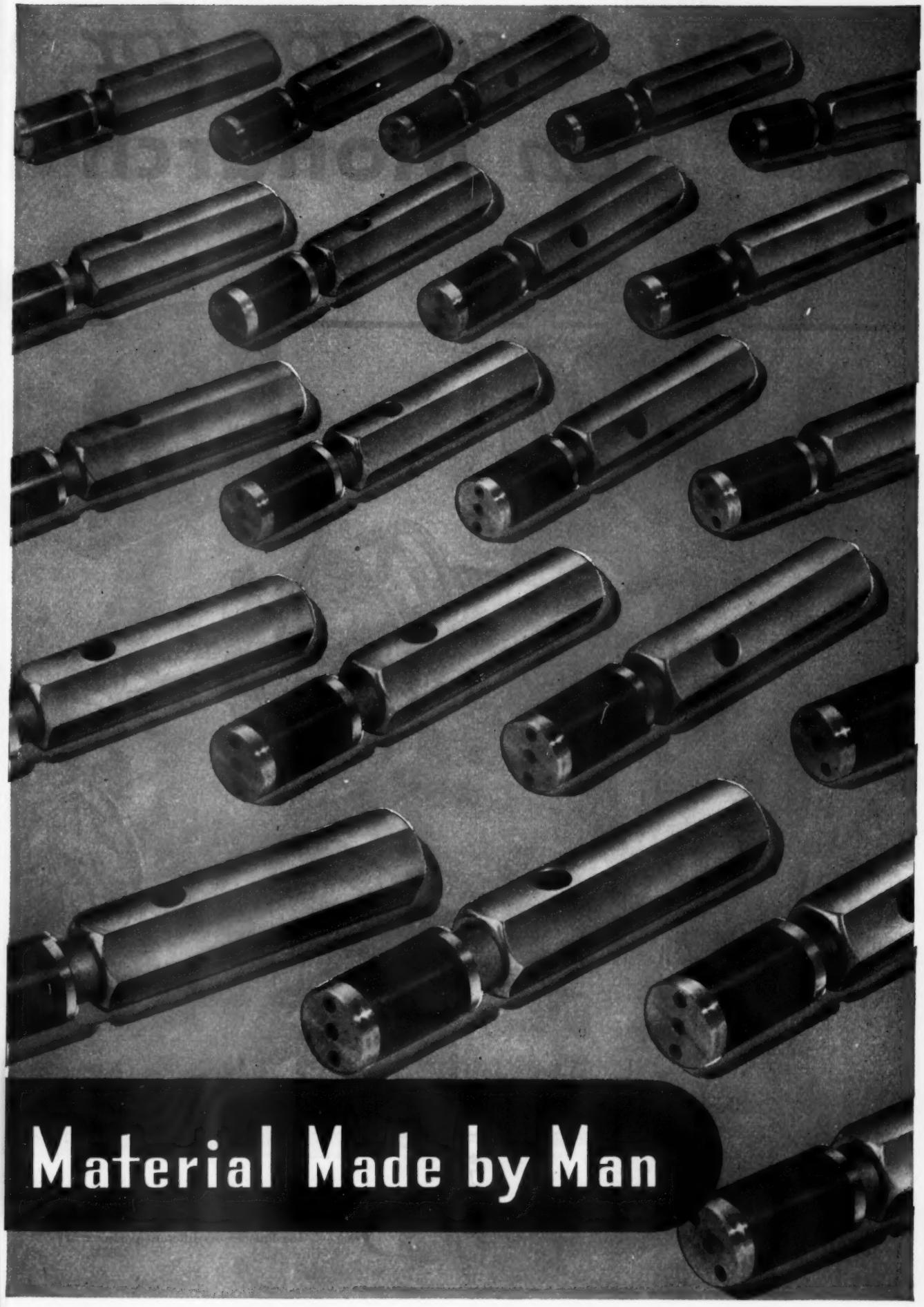
On the basis of annual costs it was estimated that the cost of tool steel gages for one year would be $15,600; chrome plated gages $11,200; tungsten carbide gages $468. The cost of NORBIDE Gages for one year was figured at $100.

In addition to their resistance to wear, NORBIDE Gages will not scratch, pick up lint nor become charged with particles of metal. Ask your regular supplier for NORBIDE Gages — or for further information write to:

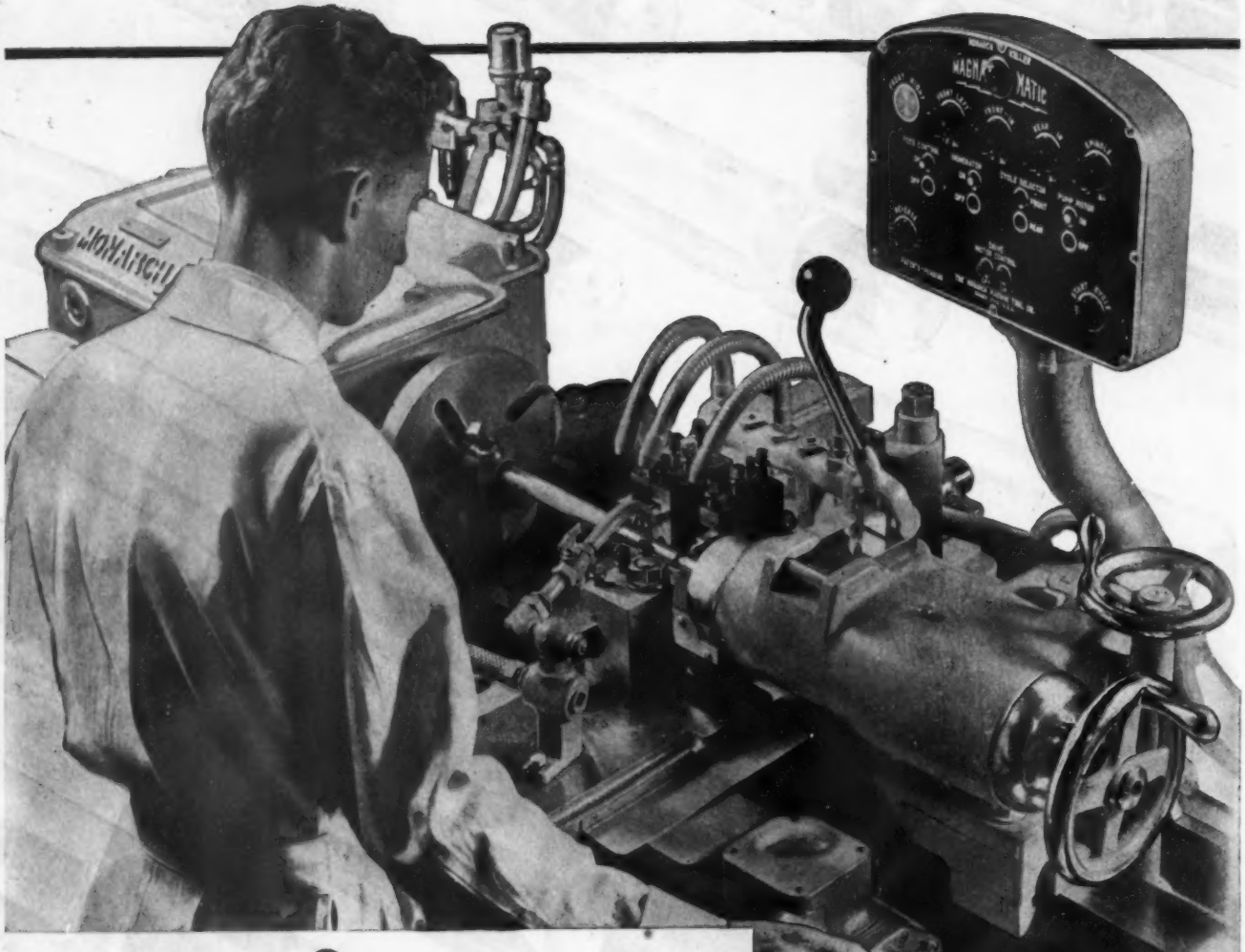
NORTON COMPANY - WORCESTER 6, MASS.

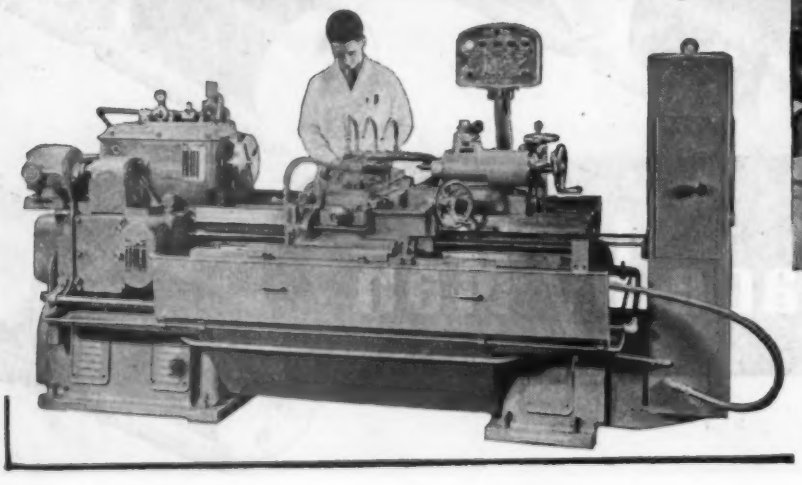
NORBIDE — The Hardest

REGISTERED TRADE MARK


Material Made by Man

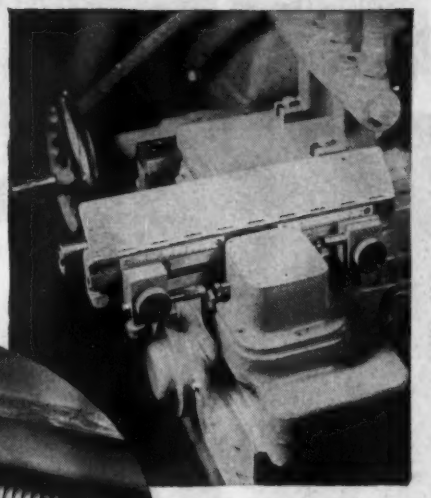
Quick setups for **on Monarch**





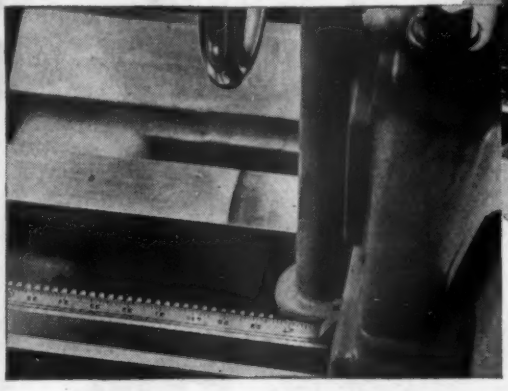
Electric controls permit automatic selection of 6 different feed rates, for faster metal removal or for varying finishes on different portions of work.

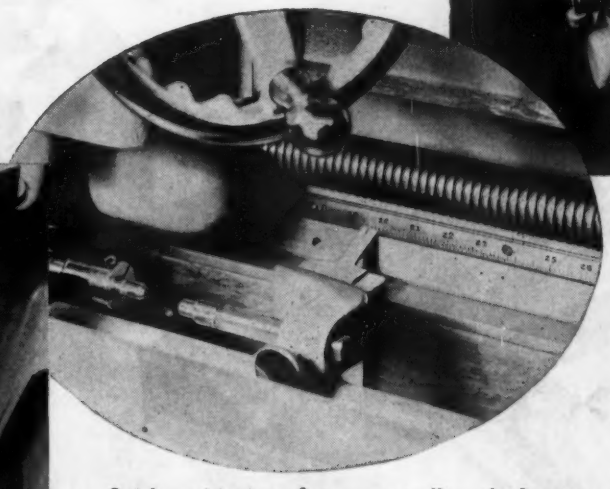
short runs Magnamatics



Another quick setup feature of Monarch Magnamatics is the finger-tip control of travel to the slides, with easy reading and accurate micrometer adjustments.

Scale and pointer on tailstock for ready positioning of tailstock for various lengths of work. This eliminates necessity of repositioning on setup.





Quick positioning of stops controlling the longitudinal travel of carriage is provided by scale pointer with micrometer finger-tip adjustment.

The facilities illustrated show how the Monarch Magnamatic provides quick, accurate setups. With setup time as low as 5 minutes in many cases, the Magnamatic can be profitably used for as few as 25 pieces, with rising economies on longer runs.

The Monarch Magnamatic is a fully automatic, all-electrically controlled, double-carriage machine for turning, boring and facing work. For 10 years it has saved time and money on peace and war production—and has been constantly improved with the advance in electrical control devices.

One button on the electric control panel starts the complete automatic cycle, and from then on the machine is 100% automatic, allowing one operator to attend two or more machines, with resulting manpower saving and production economy.

Ask the nearest Monarch office or representative to show you how you can apply Magnamatics to your turning, boring, or facing work.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

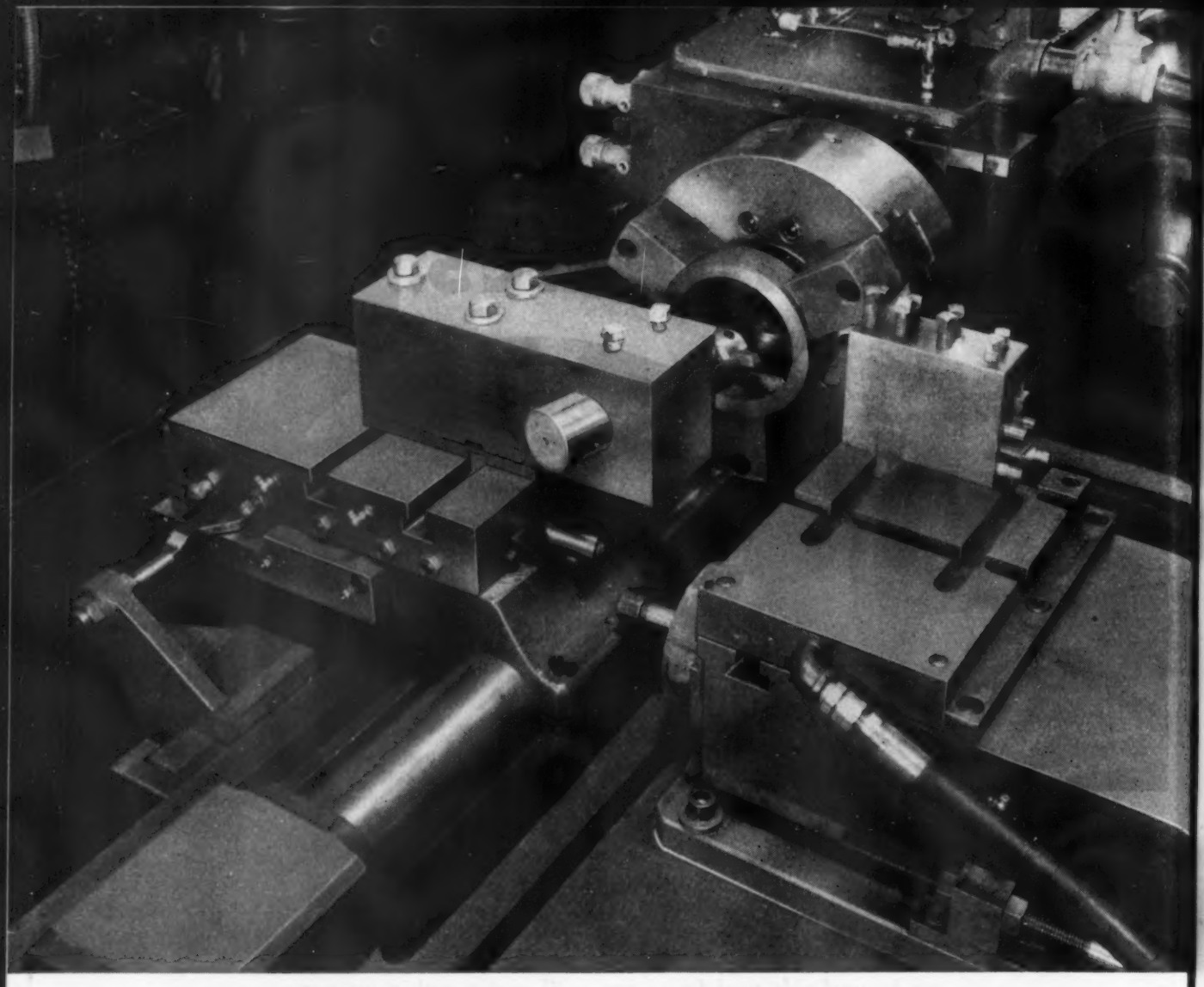
INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

Monarch Saves Time



Why this AUTOMATIC LATHE maintains *Greater Accuracy*

In the GISHOLT HYDRAULIC AUTOMATIC LATHE, feed pressures are applied directly to tools without intermediate cams, arms or other linkage. Accuracy is further insured by feeding against dead stops. In all cuts there is a moment of dwell during which cuts are cleaned up.

Front carriage is mounted on and driven by the massive bar to which it is clamped. Wide lateral support of carriage assures rigid alignment without tremble or tremor.

Movement of the massive rear slide is by hydraulic piston in the base of the slide itself.

Both carriages are directly supported by the massive integrally cast cabinet type bed and all bearing surfaces, ways and gibs are hardened and ground to assure permanent accuracy.

THE GISHOLT HYDRAULIC AUTOMATIC LATHE—*a genuinely rugged 12-inch lathe, also suited for light, fast jobs. Handles chucking between centers or fixture-held work.*

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

GISHOLT

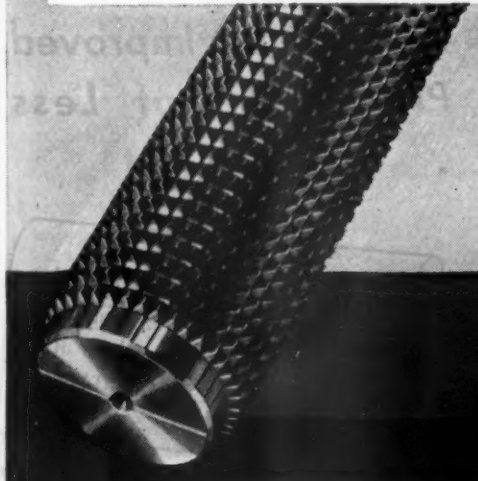
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

In Broaching A Good Tool Comes First!

Insist on CONTINENTAL BROACHES

If you want to get all-round top performance in your broaching operations . . . *the best in low unit costs, in production, in accuracy and finish* . . . make sure the broach you use is designed and manufactured by Continental Tool Works, for 26 years a main source for fine cutting tools. The wide experience in the broach-making field that Continental engineers have had is at your disposal. If you have a broaching problem, consult them today.

Continental makes a complete range of internal and external (surface) broaches, also broach fixtures, holders and pullers, all to high Continental precision standards.



CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

CTW
EX-CELL-O CORPORATION

CUTTING TOOLS

- Boring Bars and Tools
- Broaches Broach Pullers Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

WHAT'S FOR

Competition Will Be Keen

• • •

Lower Unit Costs Will Be Essential

●

Ex-Cell-O Special Purpose Machines Often Give Improved Production at Less Unit Cost

Where increased production, high accuracy, and greater economy through multiple operations are required . . . See Ex-Cell-O First!

EX-CELL-O CORPORATION

AHEAD

YOUR BUSINESS?

XLO

EX-CELL-O *for* PRECISION

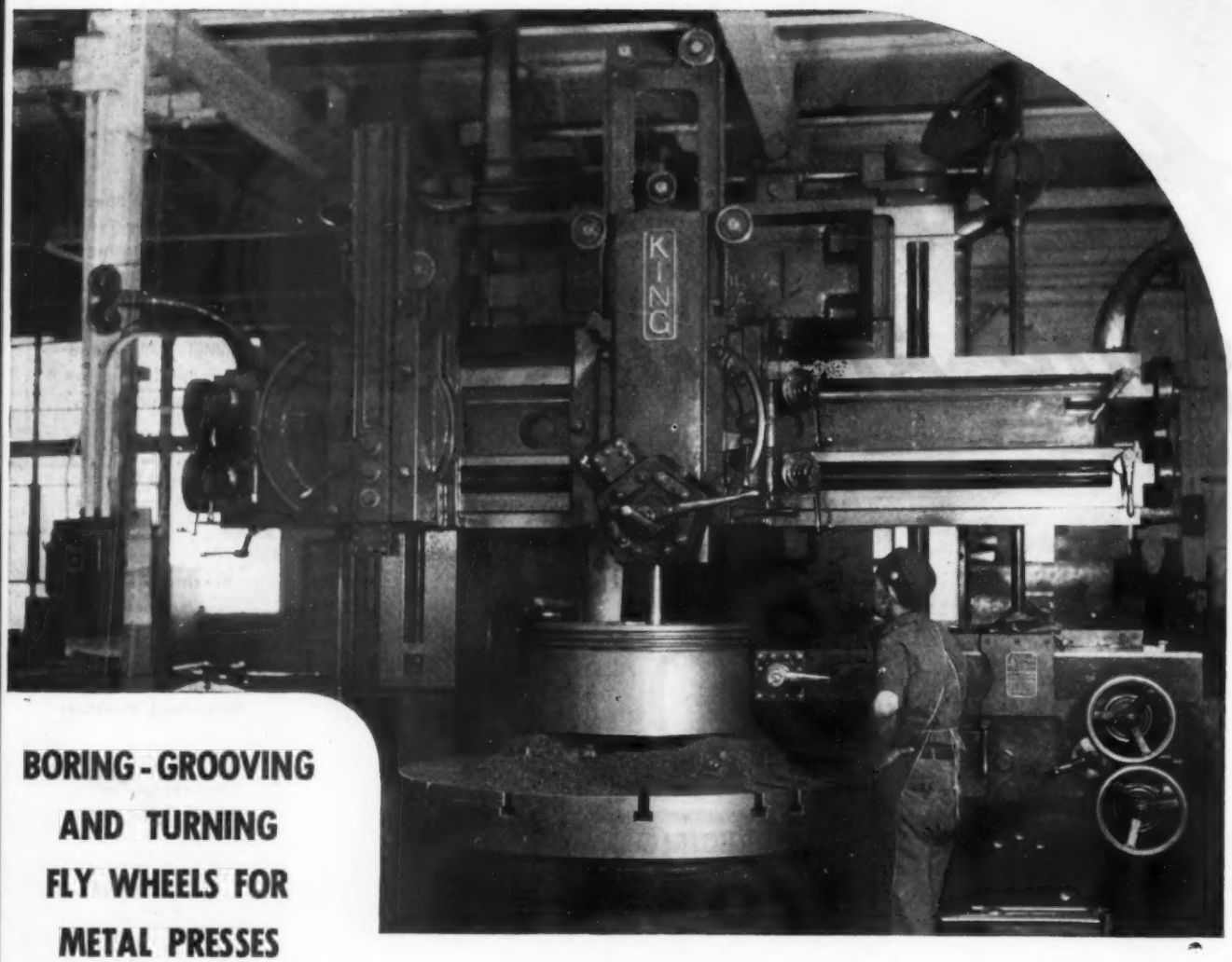
Ex-Cell-O Style 56 three-way machine. Part is differential carrier for military tank. The part is finish bored and counterbored to close limits.

EX-CELL-O *makes*

- Standard and Special Multiple Way-Type Precision Boring Machines
- Multiple Drilling and other Special Purpose Machines
- Precision Thread Grinding Machines
- Precision Lapping Machines
- Broaches and Broach Sharpening Machines
- Continental Cutting Tools
- Tool Grinders
- Hydraulic Power Units
- Grinding Spindles
- Drill Jig Bushings
- Fuel Injection Equipment
- R. R. Pins and Bushings
- Pure-Pak Paper Milk Bottle Machines
- Aircraft and Miscellaneous Production Parts

DETROIT 6, MICH.

45—66



BORING - GROOVING AND TURNING FLY WHEELS FOR METAL PRESSES

KING

VERTICAL BORING AND TURNING MACHINES

● Flexibility to meet wide range operations is one of the many assets of the King Vertical Boring & Turning Machine.

A typical example is the flywheel shown on the King Vertical Boring Machine. The flywheel is turned—grooved and the hub bored at one setting.

When you have work calling for boring, turning and facing operations put it on a King—for speed—accuracy—low cost production.

KING BUILDS

Vertical Boring and Turning Machines exclusively—single column types from 30" to 42" and double column types from 52" to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

The National Interregional Highway Committee and the American Trucking Association have agreed on the continuance of the schedules of truck sizes and weights accepted by the states for the war emergency. *Engineering News Record.*

get ready with CONE for tomorrow

An electronic tube has been developed capable of amplifying grid currents as minute as .00000000000001 ampere. *Ohmite News.*

get ready with CONE for tomorrow

Two industrial plants have installed steam-heated sidewalks to make snow shoveling unnecessary. *Sarco Mfg. Co., Bethlehem, Pa., Hewitt Rubber Co., Buffalo, N. Y.*

get ready with CONE for tomorrow

A compound called "2-4-D" is being tested on golf greens. It appears to be successful in selectively killing weeds without damaging the grass. *Science Digest.*

get ready with CONE for tomorrow

More than 200 industries, including the manufacturers of chewing gum, glass, synthetic rubber, drugs, textiles, paper and printing are finding that controlled heat and humidity (air conditioning) are essential to their work. *Wall Street Journal.*

get ready with CONE for tomorrow

A new laboratory exclusively for the study of jet propulsion fuels and lubricants has just been put into operation. *Wood River, Illinois.*

get ready with CONE for tomorrow

An electronic device rides with a test pilot and sends back eighty instrument readings per second covering stresses, temperature and speed. *Consolidated-Vultee.*

get ready with CONE for tomorrow

A new variation of the magnetic sound recorder uses a paper tape covered with powdered iron. It is claimed to be cheaper and more efficient than wire. *Radio & Television Retailing.*

This country's production of electrical instruments has increased 4,000 per cent since the beginning of the war. *Electrical Manufacturer's Public Information Center.*

get ready with CONE for tomorrow

A new semi-precious stone derived from deposits in this country is called "Hemetine." *Gabriel Williams Co., N. Y.*

get ready with CONE for tomorrow

A new pencil is said to make 12 carbon copies without cutting the paper. *Reliance Pencil Co., Mt. Vernon, N. Y.*

get ready with CONE for tomorrow

One of the suggested improvements in locomotive power is the use of mercury vapor in place of steam. *Business Week.*

Lace can now be made on a foundation of polyvinyl alcohol sheeting which is easily dissolved after the weaving is done. *E. I. duPont deNemours.*

get ready with CONE for tomorrow

An automatic headlight dimmer uses an "electric eye" to dim the lights on one car when the lights of another approach it. *Arrow Safety Device Co., Mt. Holly, N. J.*

get ready with CONE for tomorrow

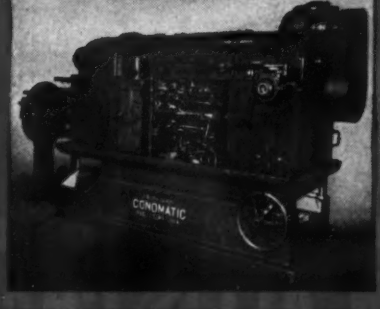
Tetra Cresyl Silicate has been found far superior to water for the transference of heat. By its use a temperature of 800 degrees could be piped around the house from a central plant and could be used to heat stoves, irons, water tanks, or small appliances. Connected in summer to a refrigerating plant, it could also cool the house. *Science Digest.*

get ready with CONE for tomorrow

One of the largest American drug manufacturers has set up a "pilot farm" to experiment with the growing of drug plants that were formerly imported. *S. B. Penick & Co., N. Y.*

The Important SECOND

Modern production emphasizes the second, and users of the 8-spindle Conomatic think of parts like these in terms of seconds. The return of peace, and of peacetime production, will place even greater emphasis on the second — and on the importance of the Conomatic.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

20

Yes, Men Make Motors!

NO MACHINE KNOWN can duplicate the skill of Sam Meister, left, of Allis-Chalmers Norwood Works.

Holding an acetylene torch in his right hand, a silver alloy rod in his left, Sam silver-brazes end connections of Allis-Chalmers' "Indestructible Rotor."

Round and round the connections he works — expertly flowing in molten alloy to form a joined structure that can withstand as much heat as though it were a single die-casting.

No machine can do that job — and no machine can fully test how well it is done.

There's only one test . . . wait 5, 10, 15 years and *see.*

And that's the test in which Allis-Chalmers motors have proved over the years that they're *great* motors. That's why you hear it said so often: *"You can depend on Allis-Chalmers Motors!"*

• • •

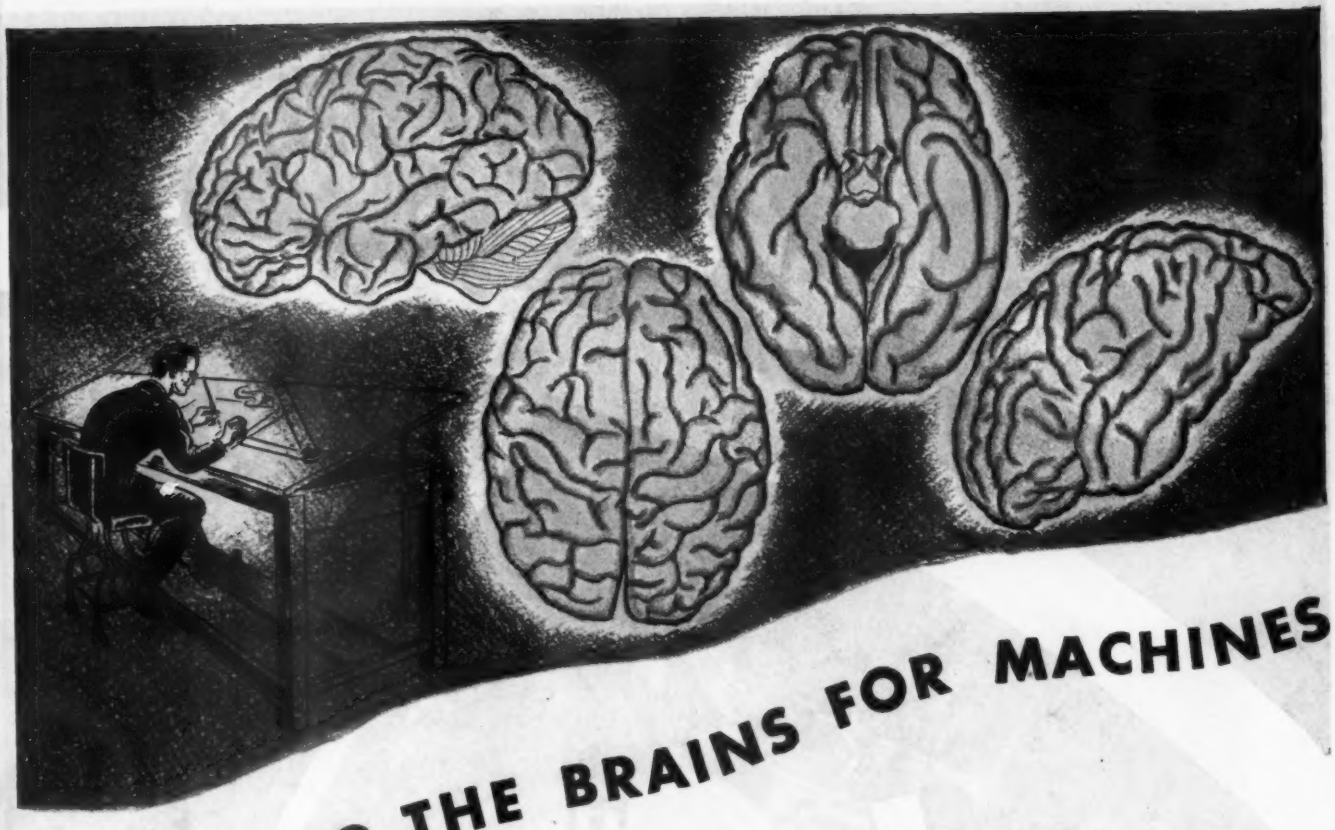
YES, HUNDREDS of Allis-Chalmers men—craftsmen like Sam Meister — know they have a big personal stake in every Allis-Chalmers motor. When they build a great motor for you, they're making a *friend* . . . and they know that's something no company and its workers can have too many of.

Next time *you* need great motors contact our district office. Or write direct to ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

A 1730

A-C WE WORK FOR VICTORY WE PLAN FOR PEACE

YOU CAN DEPEND ON ALLIS-CHALMERS MOTORS

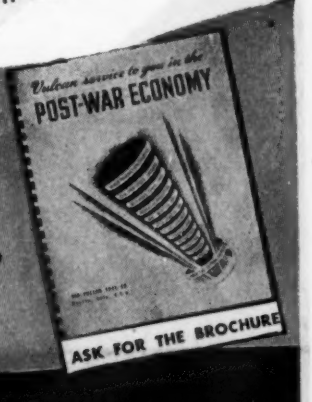


DESIGNING THE BRAINS FOR MACHINES

It is not enough in these days that machine tools should relieve men of the back breaking physical labor of pushing a planing tool, bearing down on a drill, and driving a saw.

Brain operations such as the calculating and measuring for all cutting, stamping, drilling, and grinding should also be turned over to machines.

Only dies, jigs, and special tools can perform these brain operations swiftly, automatically, and precisely. Vulcan can design infallible and untiring brains for many of your machines which never had brains of their own before.



The VULCAN TOOL Co.
730 LORAIN AVE., DAYTON 10, OHIO

3 Quick ways

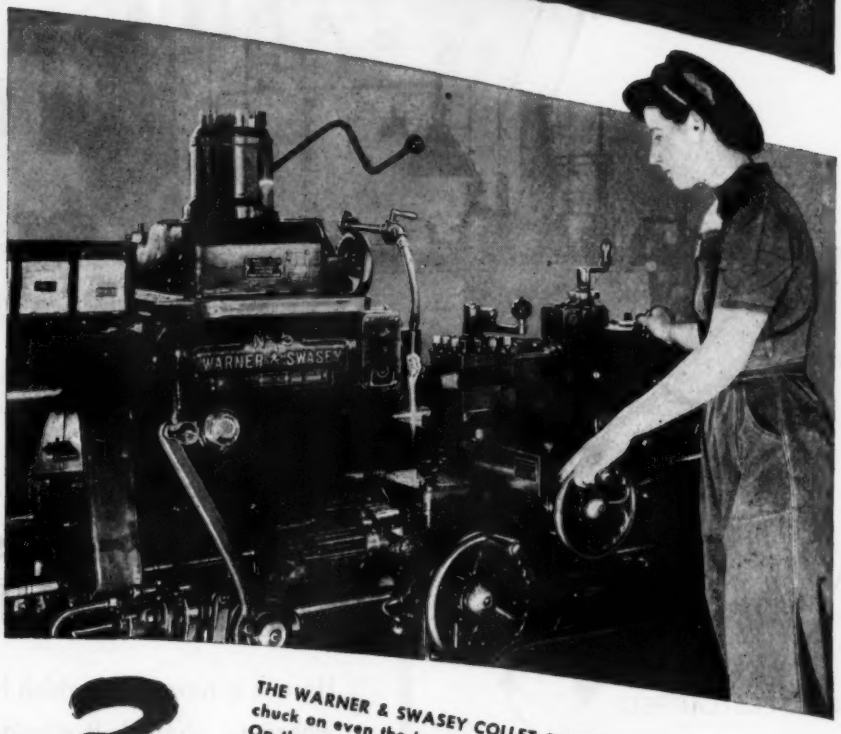
1. THE WARNER & SWASEY POWER CHUCK WRENCH opens and closes heavy chuck jaws at the turn of a control handle—does in seconds what may take minutes by heaving and tugging with a hand chuck wrench. Speeds output by a third on many high production jobs; helps eliminate production sags caused by operator fatigue, and by making chucking jobs easier to handle. Also gives exactly same desired pressure every time to protect finely machined surfaces and thin wall jobs.

2

TURRET LATHES, SADDLE AND RAM TYPES — CHUCKING AND BAR TOOLS, PRECISION TAPPING AND THREADING MACHINES

TO CUT PRODUCTION COSTS

NGED CROSS SLIDE CUTS are facilitated by the ner & Swasey Hollow Center Square Turret. Elimi- ng the conventional center stud, this patented square et holds several tools in the same station for simul- aneous multiple cuts. On this job, facing and mfering a thread diameter and facing another ulder are being done at one single operation.



3.

THE WARNER & SWASEY COLLET CHUCK BOOSTER closes the collet chuck on even the heaviest jobs with only a light push by operator. On the job illustrated above turning, boring and reaming a bronze pump sleeve, the collet chuck booster permitted a woman operator to be used. It paid for itself in 90 days by upping production 15%. On your turning jobs requiring frequent chuckings, the collet chuck booster can reduce operator fatigue and save chucking time for you, too!

These three time-saving and labor lightening accessories have boosted output and conserved manpower in plant after plant during the critical war production era. If you are worried about high production costs in the stiff postwar competition ahead—if you want to realize more from your present turret lathe investment—here are three proven ways of doing it!

The improvements are relatively inexpensive, can be installed quickly — and *usually pay for themselves* in a few weeks. Why not let a Warner & Swasey Field Engineer show you in exact figures how these tools might pay off in your plant. Or write Warner & Swasey, Cleveland, Ohio.

WARNER & SWASEY
Machine Tools
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

Don't wait for special plug gages!

Finish your own—

FROM THIS SET OF

SCHERR PLUG GAGE BLANKS

Here is a new idea, which has been received with enthusiasm wherever offered. It eliminates delay in starting production on a hole job, while waiting for delivery of the necessary plug gages.

Any shop with a good toolroom or cylindrical grinder can finish these blanks to specified size. The set includes blanks for finished sizes from .029" to 1.010". The blanks are complete and finished in every respect except for final grinding. Both centers are lapped for accurate centering, and all that is needed is a few minutes between centers on a cylindrical grinder, with lapping in addition if finer than commercial finish is required. There are 36 blanks in the set and 7 hexagon handles.

Price for the complete set, $49.50. Individual gage blanks available from .059" to 1.510". Write for details and quotation.

THE EASY WAY TO CHECK PLUG GAGES —a Scherr Comparitol and a set of Scherr Ultra-Chex — the gage blocks that give 80,000 combinations in steps of 1/10,000"

GAGEMAKERS — BIG SAVINGS FOR YOU! *In making up gages to your customer's orders, why not buy the blanks from us? You save time, trouble, money. Ask us for quantity quotation.*

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

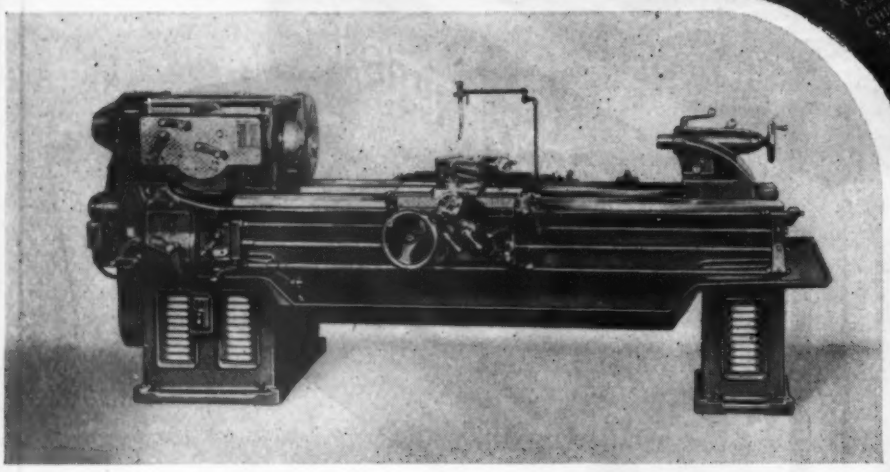
SPECIFY HARDINGE COLLETS FOR ACCURACY AND DURABILITY

When ordering collets only, or when ordering collets with lathes or milling machines of any make or size, specify HARDINGE Precision Collets. Since 1890, HARDINGE collets have been recognized for accuracy and durability.

Write for Bulletin 41 which lists the various standard types, gives engineering data, shows what collets are used in your machines and the attractive prices which apply.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"



SIDNEY *16×72 inch* HERRINGBONE GEARED LATHE

● Here is a highly developed machine with power and rigidity to take heavy cuts with alloy tipped tools yet sensitive enough for chasing threads and taking fine finishing cuts.

The continuous tooth Herringbone geared head developed by Sidney provides a smooth flow of power to the spindle with no thrust loads. Both the spindle and intermediate shaft are supported by center bearings in addition to the conventional end bearings.

It is this care of design and construction of Sidney Lathes that enables them to maintain accurate—high speed production over long periods.

There's a size and type available to meet your lathe requirements. Also bulletins on all sizes are at your disposal.

SIDNEY

The SIDNEY MACHINE TOOL *Company*

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

BETTS-BRIDGEFORD LATHES

BETTS-BRIDGEFORD LATHES

For Speed, Accuracy and Economy

BETTS-BRIDGEFORD
96" COMBINATION
BORING AND TURNING LATHE

This Betts-Bridgeford Lathe will swing work 100 inches in diameter over the bed. It takes 70 feet between centers, and will bore up to 25 feet in length. ACCURATE . . . POWERFUL . . . FAST.

Betts-Bridgeford Lathes are built from 26" up to any requirement

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOL CORPORATION • ROCHESTER 10, NEW YORK

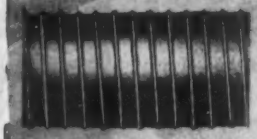
THREAD TOOL AND CUTTER

USED ON ANY SCREW-CUTTING LATHE FOR PRODUCING PERFECT THREADS

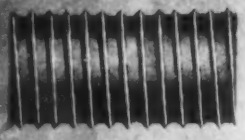
The Rivett Thread Tool mounts on lathe tool slide and takes the place of single point thread tools and chasers. The tool is a holder for a ten tooth cutter with means for indexing the cutter to present each of the ten teeth successively to the work. The first nine teeth rough out the thread in nine heavy, measured cuts, the tenth tooth finishes the thread. The ground cutter controls the perfect form and lead of the thread. The responsibility of the operator is reduced to indexing the cutter when reversing the lathe. A cutter can be furnished for threads up to 4" diameter in any form and in pitches of six threads per inch and finer.

Write for Bulletin 110

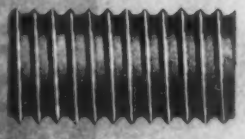
DEVELOPMENT OF THREAD AFTER PROGRESSIVE CUTS



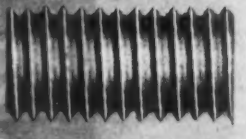
After Cut No. 1



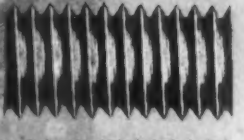
After Cut No. 3



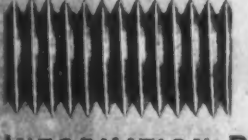
After Cut No. 5



After Cut No. 7



After Cut No. 9

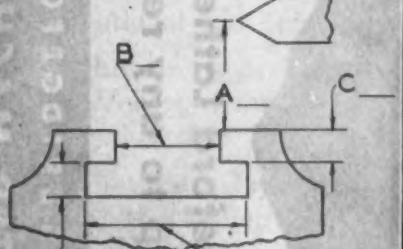


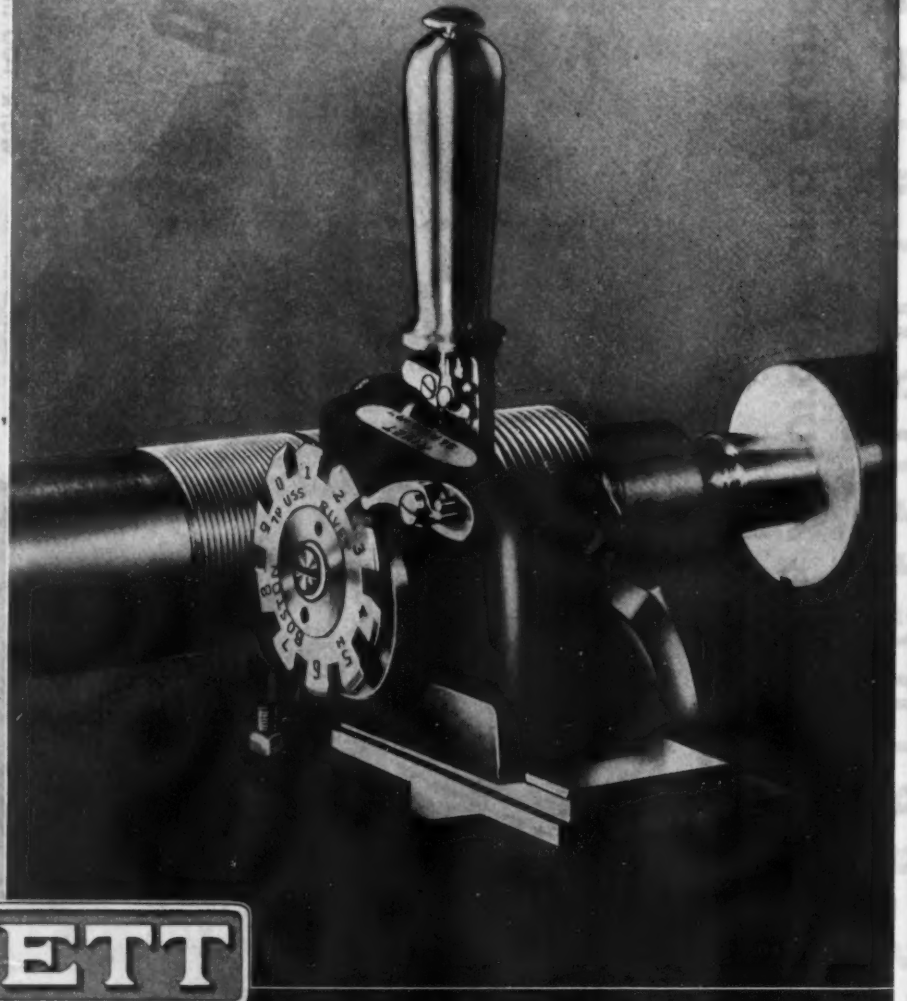
After Cut No. 10

INFORMATION REQUIRED TO FILL ORDER

Base to mount thread tool is machined to fit lathe tool slide and give proper height to cutter. Therefore the five dimensions, marked A-B-C-D-E, on diagram must be given.

A separate cutter is required for each pitch and form of thread. Therefore the form and pitch of each cutter must be given.





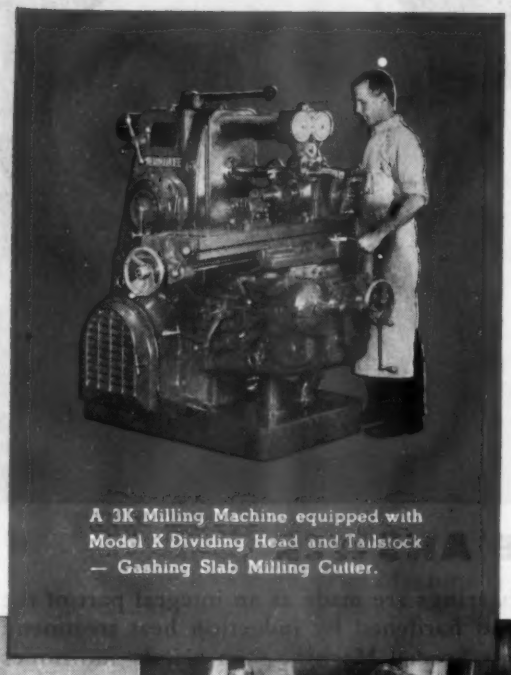
RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

WHEN MILLING HAS TO BE DONE WITH SPEED, PRECISION, PROFIT

PUT IT ON A *Milwaukee*

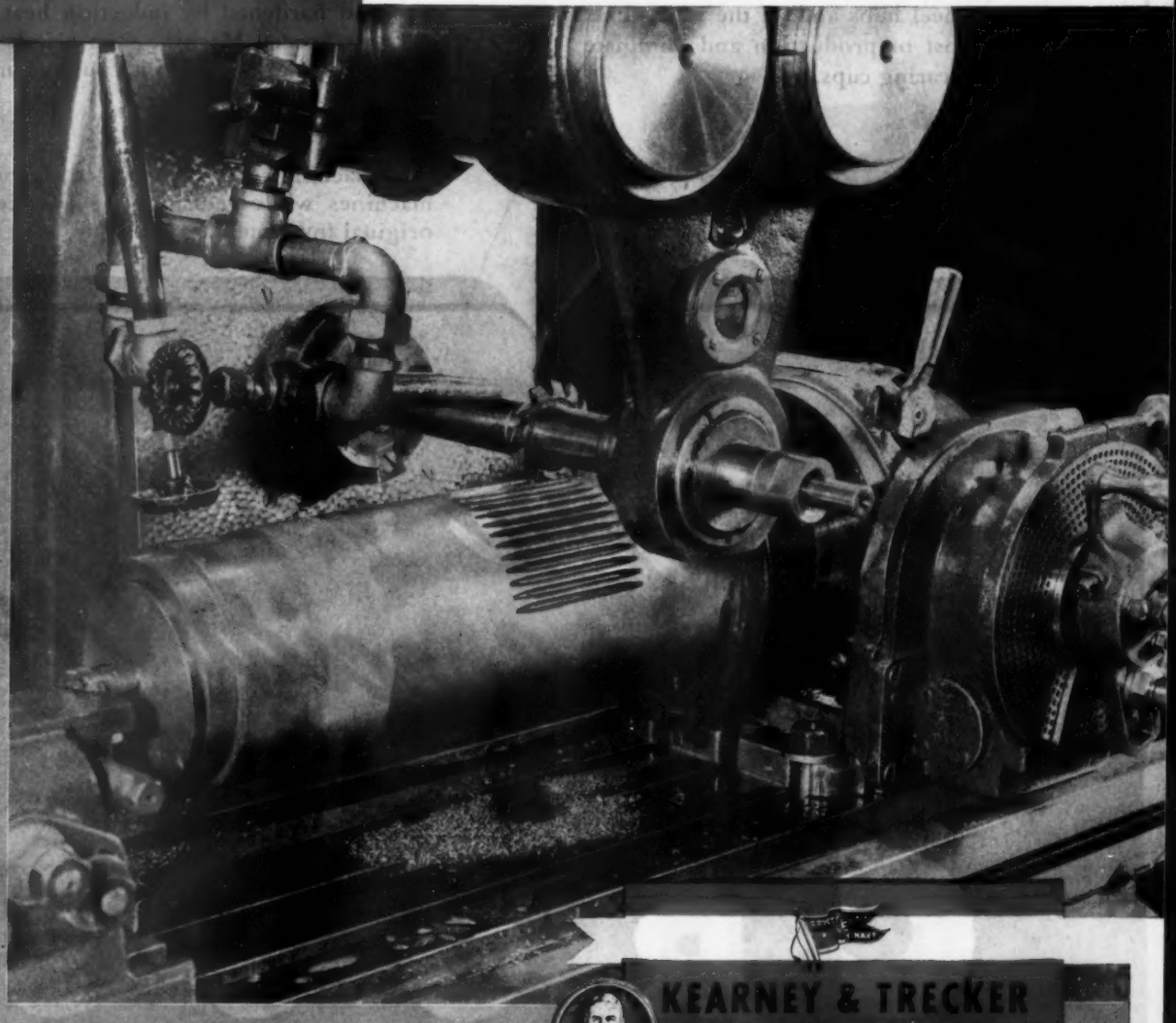


A 3K Milling Machine equipped with Model K Dividing Head and Tailstock — Gashing Slab Milling Cutter.

In tool-room or laboratory — on the production line — wherever milling has to be done — simple routine job or "tricky" operation — put it on a Milwaukee! Experienced machine-shop men prefer to use a Milwaukee when it is available because they know that's the way to get the work done — with speed, precision, profit.

Time-tested, production-proved, modern in every detail of design and construction but free of untried features, Milwaukee Milling Machines yield the sustained performance — with precision and speed — that spell profit in milling operations.

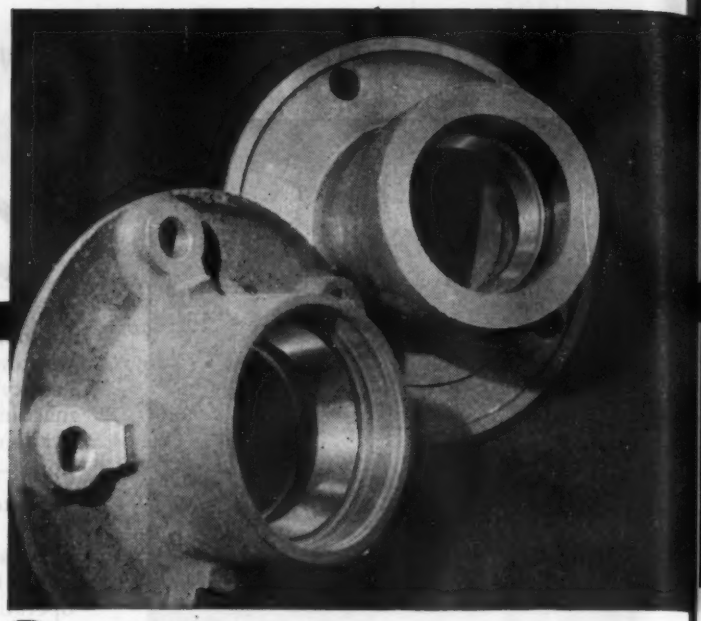
Write for new Bulletin K10 giving detailed and descriptive information on Model 2K and 3K Milwaukee Milling Machines.



Milling a worm gear in a spindle quill on a 3K Universal Milling Machine. Angular 7° spacing of cut is indexed with less than one turn of the index handle on the Model K Dividing Head.

Milwaukee Machine Tools

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN



1 THE PROBLEM

To improve bearing concentricity in automotive wheel hubs and, at the same time, cut the cost of production and eliminate separate bearing cups.

2 THE ANSWER

The bearings are made as an integral part of the hub and hardened by induction heat treatment. A Cross Special Machine then grinds and hones the bearings to 3-micro inch surface finish.

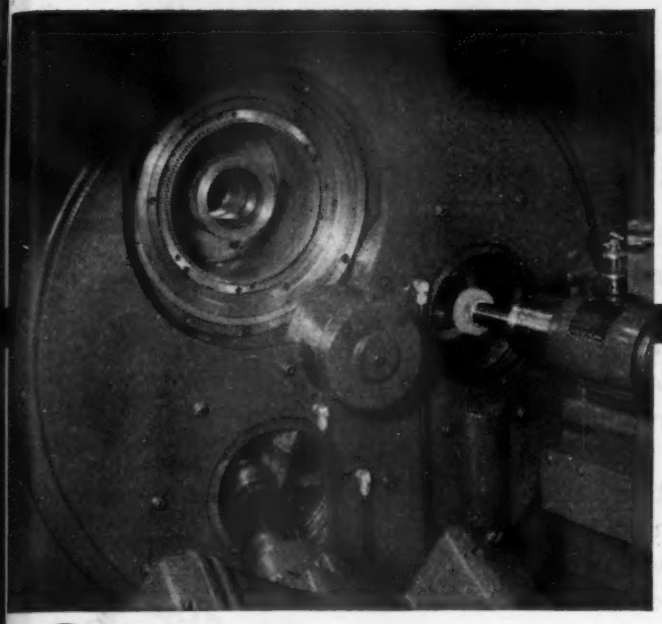
3 THE SAVINGS

The machine replaces 4 skilled operators and 3 machines while returning 33% savings on the original investment.

Cut Your Costs with

CROSS

New York • Chicago • DETROIT • Cleveland • Cincinnati



4 THE MACHINE

A 4-spindle Cross Special Machine with a 3-station trunnion type fixture first indexed the work-piece between two opposed grinding heads and next between two opposed honing heads. All four heads operate simultaneously to grind and hone both bearings at opposite ends of the hubs. The trunnion then indexes to a third station for unloading and reloading the hubs. Production is at the rate of 50 hubs an hour, automatically machines to an accuracy of 3-micro inch surface finish.

Cross Special Machines have proved their economy in operation and are a means whereby a substantial profit will be possible in the highly competitive postwar market. May we help you prepare for it? Write The Cross Co., Detroit 7, Mich., Dept. 151.

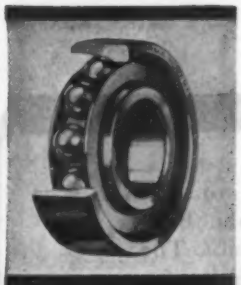
S-22

SPECIAL MACHINES

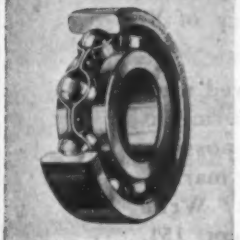
for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

VICTORY, first: THEN—

PRECISION BEARINGS FOR EVERY PURPOSE, INDUSTRIAL AND DOMESTIC



Separable (Magneto) Ball Bearing



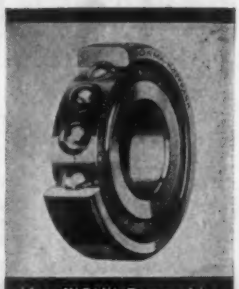
Single Row Ball Bearing

War's demands still call for all the output of the NORMA-HOFFMANN factory. But, already, far-sighted manufacturers are working with NORMA-HOFFMANN engineers on their designs for new and better peace-time products equipped with PRECISION BEARINGS.

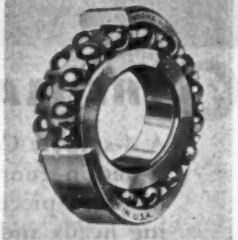
No "Re-conversion Problem" will hamper or delay NORMA-HOFFMANN post-war production. The moment peace is declared, all our vast facilities will be turned INSTANTLY to the production and prompt delivery of PRECISION BEARINGS for new and better domestic appliances and for new and better tools for industry.

Our Field Engineers, in all our District Offices, are ready to work with YOUR designers. Avail yourself of their experienced counsel NOW—without obligation, and of course in strict confidence. *Write for the Catalog—Today.*

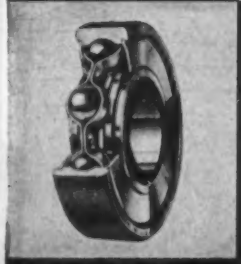
TO WIN THE WAR: WORK—FIGHT—BUY WAR SAVINGS BONDS!



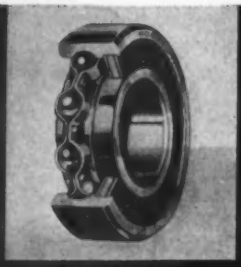
Litro ("CL") Composition Retainer Ball Bearing



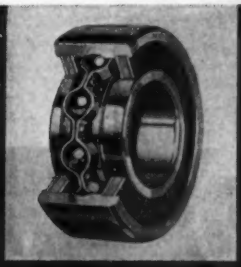
Double Row Self-Aligning Ball Bearing



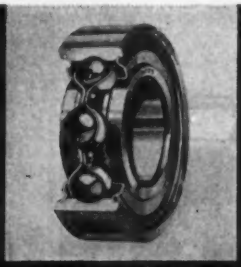
Shielded Type Single Row Ball Bearing



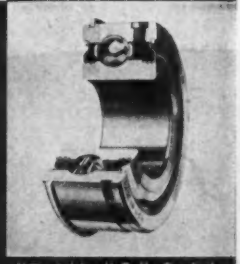
Single Felt Seal Ball Bearing



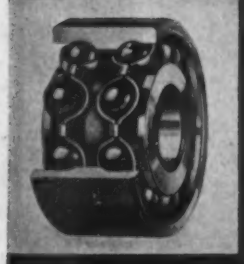
Double Felt Seal Ball Bearing



9000 Series (Feltless) Sealed Ball Bearing

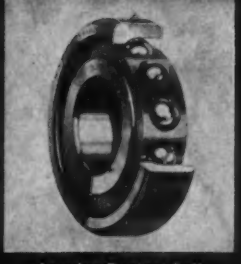


"Cartridge" Fully Sealed, Refillable Type Ball Bearing

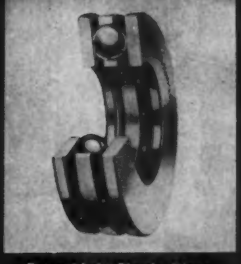


Double Row Ball Bearing

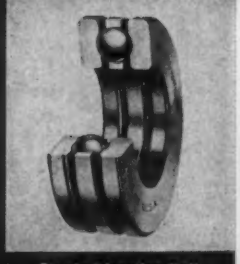
Extra Light Type Ball Bearing



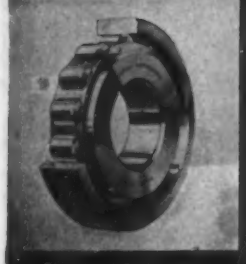
Angular Contact Ball Bearing



Extra Light Single Direction Ball Thrust Bearing

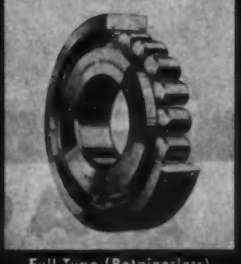


Single Direction Ball Thrust Bearing



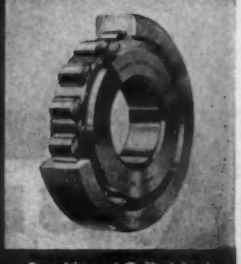
Standard Cylindrical Roller Bearing

Type "E" Cylindrical Roller Bearing



Full Type (Retainerless) Cylindrical Roller Bearing

Extra Light Cylindrical Roller Bearing



Two-Lipped Cylindrical Roller Bearing

NORMA-HOFFMANN BEARINGS CORP'N. STAMFORD, CONN. *Founded* 1911

Field Offices: NEW YORK • CHICAGO • CLEVELAND • CINCINNATI • PITTSBURGH • DETROIT • LOS ANGELES • SAN FRANCISCO • SEATTLE, WASH.

Ultimate Accuracy
IN PRECISION CHECKING OF GAGES AND LAPPED PARTS
assured by

Van Keuren

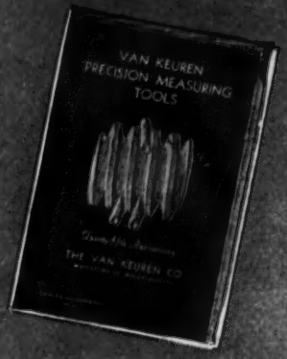
FUSED QUARTZ OPTICAL FLATS

The use of optical flats for precision measurements with light waves was pioneered by The Van Keuren Co. in 1920. The new Van Keuren double surface, pure fused-quartz flats are the result of 25 years of experience. The accuracy and workmanship is superlative.

Fused quartz is highly transparent and has exceptional wearing qualities. The expansion and contraction due to temperature change is 1/16 that of plate glass and 1/6 that of pyrex.

Specify Van Keuren double surface, fused-quartz optical flats for checking flatness of precision lapped parts, maintenance of amplifying gages, and control of gage block wear. They are the most economical to purchase and the most accurate to use.

Worn spot .000023" deep revealed on amplifying gage anvil by means of a Van Keuren optical flat.



Consult the 160-page Van Keuren Catalog No. 33 for further details. Send for your copy which also contains complete tables, data and formulas for measuring threads, gears, gages and precision parts.

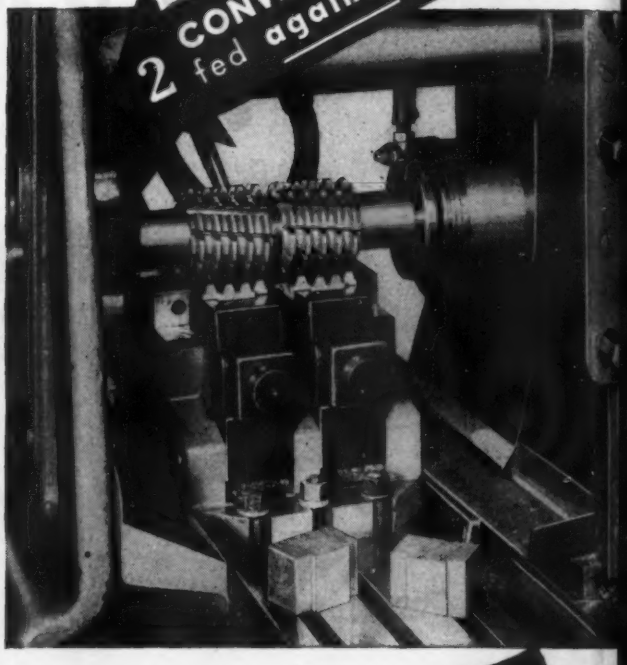
Van Keuren

25th YEAR

No. 12 PROVIDES CHOICE OF

1 CLIMB—work fed with the cutter

2 CONVENTIONAL—work fed against the cutter



ROUGH AND FINISH 3 at one loading of work, using automatic reverse in cutting feed

4 DOUBLE FIXTURE—climb and conventional using one set of cutters—full automatic cycle

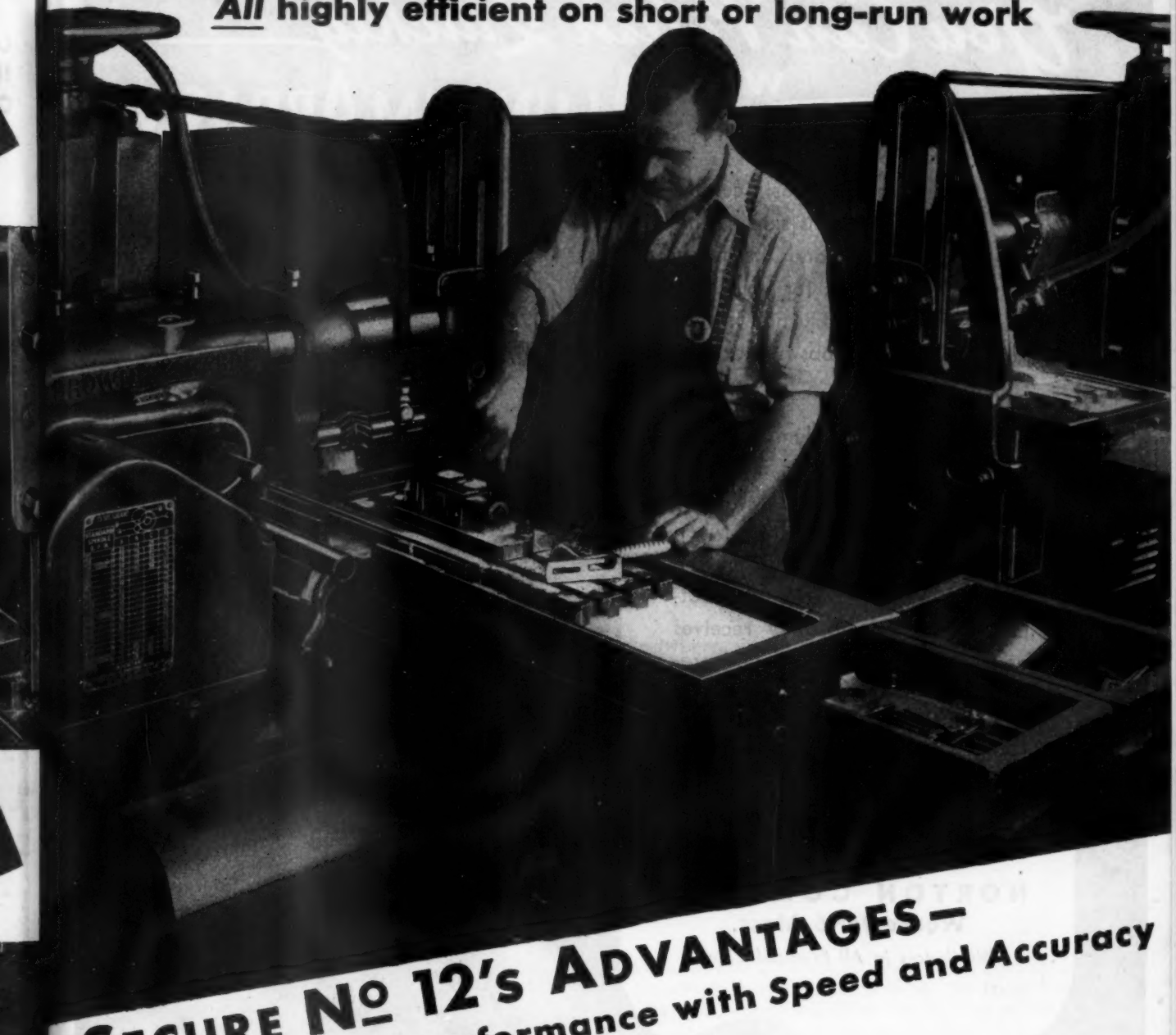
Consider the advantages of the No. 12 Plain Milling Machine in improving your milling of medium-sized work.

B&S BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

BROWN &

FOUR MILLING METHODS

All **highly efficient on short or long-run work**



SECURE No 12's ADVANTAGES—

Smooth-cutting performance with Speed and Accuracy

ELECTRICAL CONTROL

Automatic Cycles

Dual Feed Rates

(Automatically obtained during cutting cycle)

Accurate Table Stop and Reverse

Automatic Spindle Stop

- **WIDE SPEED AND FEED RANGES** for a variety of materials and cutting tools

SHARPE

You Can Polish Quickly WITH ALUNDUM ABRASIVE

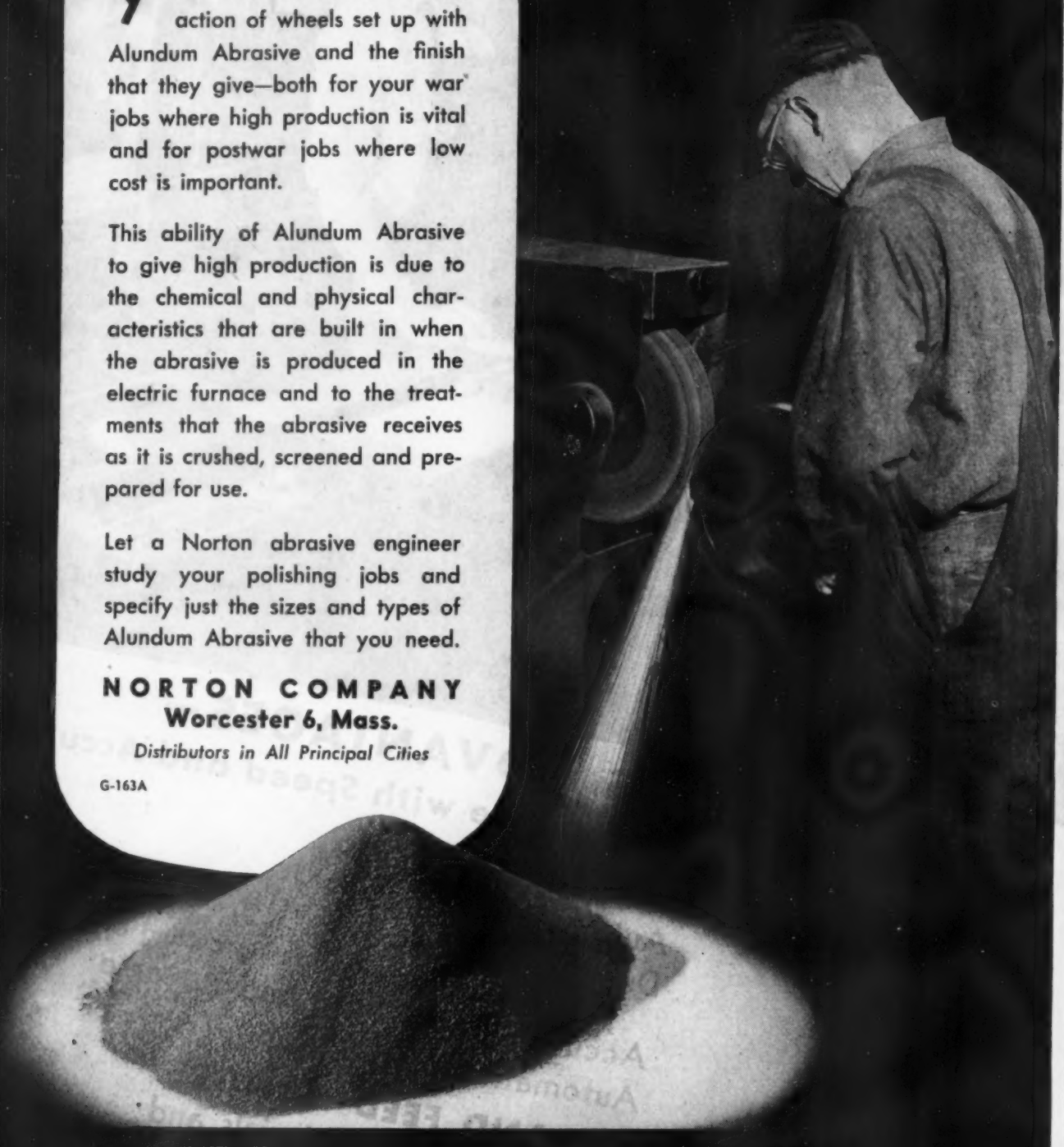
YOU'LL like the fast cutting action of wheels set up with Alundum Abrasive and the finish that they give—both for your war jobs where high production is vital and for postwar jobs where low cost is important.

This ability of Alundum Abrasive to give high production is due to the chemical and physical characteristics that are built in when the abrasive is produced in the electric furnace and to the treatments that the abrasive receives as it is crushed, screened and prepared for use.

Let a Norton abrasive engineer study your polishing jobs and specify just the sizes and types of Alundum Abrasive that you need.

NORTON COMPANY
Worcester 6, Mass.
Distributors in All Principal Cities

G-163A



NORTON ABRASIVES

What kind of monument to the Unknown Soldier's son?

Here stands one of the most hallowed monuments in the world . . . and one of the most tragic.

For this American soldier died that the world might be safe for his son.

And his son was killed.

We propose a different kind of monument to this second generation unknown.

America now is more powerful than all the rest of the world.

More powerful in thought . . . A single American magazine today, printed in 11 languages, outsells any other publication in 53 countries of the world. People are eager for American ideas.

More powerful in armament . . . We have twice the air-power, and from two to four times the naval strength of the rest of the world totaled together. People respect American might.

More powerful in wealth . . . Over half the earth's total capacity to produce is here in our plants, machinery and skills. People need the things that America can produce.

This stupendous power can break down the barriers of ignorance, intolerance and want. It can keep our nation strong. It can enforce decency and peace upon the world. Ours is the chance and the responsibility to set an example for all the peoples of the earth to see.

This would be a monument.

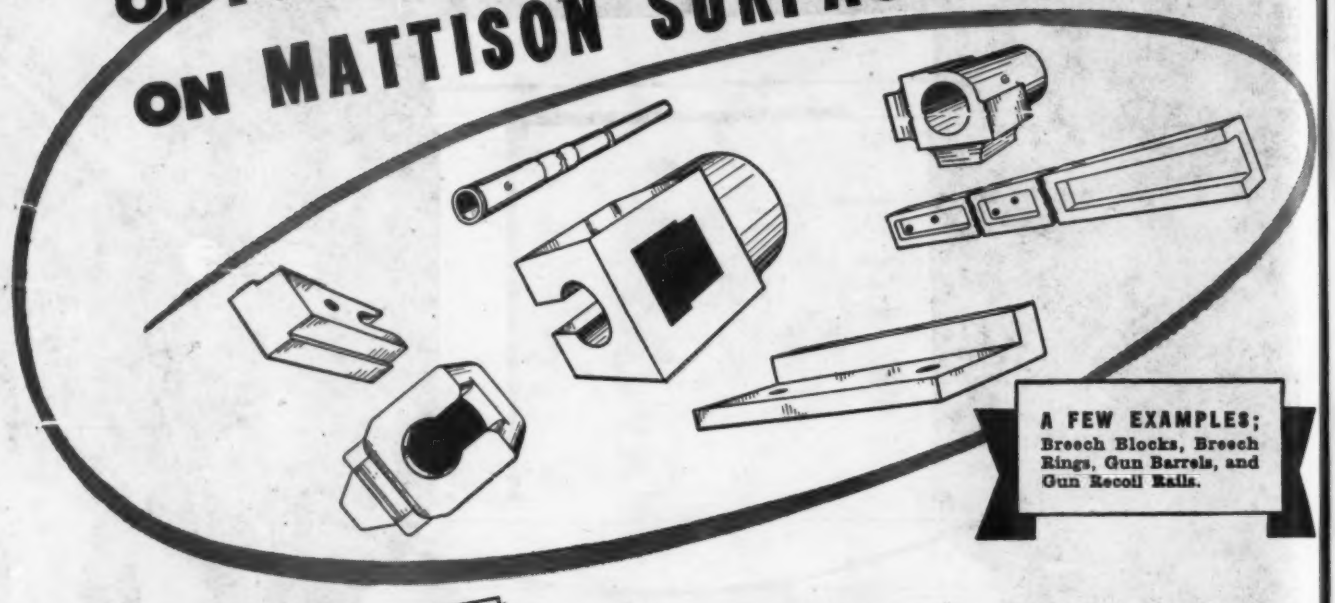
The engineers of the basic machine tool producers can help the men of government and of industry to build that monument . . . to plan now the reconversion of our power to all-out production for a better world.

One of these engineers is a Bryant man. We urge you to call him in today.

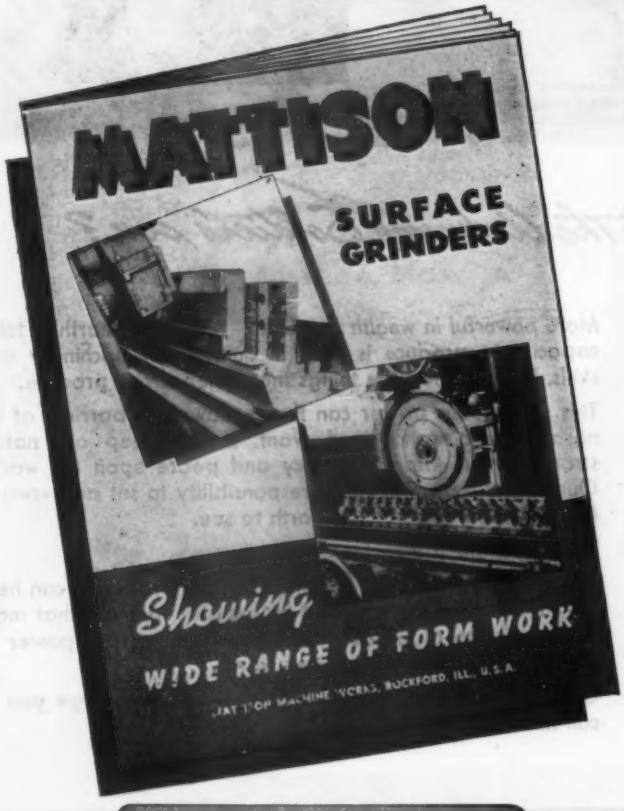
BRYANT GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

WIDE RANGE

OF FORM WORK NOW BEING GROUND ON MATTISON SURFACE GRINDERS



A FEW EXAMPLES;
Breech Blocks, Breech Rings, Gun Barrels, and Gun Recoil Rails.



Through the use of special fixtures and contour dressing devices the above parts are all being ground on the Mattison High-Powered Precision Surface Grinder with a great saving of time and to extremely close limits of accuracy. These applications are important, not only from the standpoint of present production needs, but because they illustrate the unlimited capacity of Mattison Grinders over and above regular flat grinding. To you it opens up a new opportunity for grinding, a new opportunity for saving and a new opportunity for increasing production on work previously thought impossible to grind.

Ask for new free book, showing these and other unusual jobs ground by means of special fixtures and dressing devices on the Mattison Grinder.

Send for this NEW BOOK

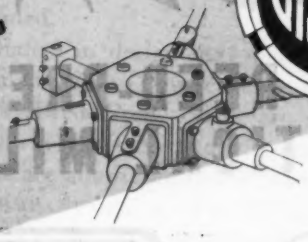
MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

CLEAN COOLANT means BETTER WORK!

✓KEEP COOLANT, SUMP AND STRAINERS CLEAN

When used too long without filtering or replacement, coolant becomes rancid and bad smelling—a carrier of disease. And dirty screens reduce coolant flow and lubricating quality.

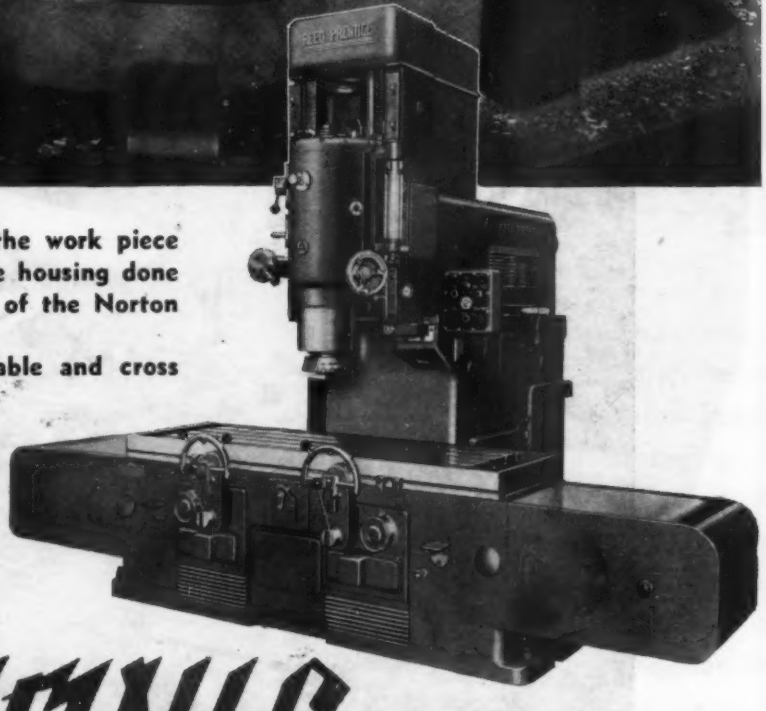
Regular attention to coolant contributes to operator health, good machining finish.



GISHOLT

• Reproductions of this page on enameled paper are available in 8¼" x 10½" size for bulletin-board use in your turret lathe department. Write the Gisholt Machine Company, 1201 East Washington Avenue, Madison, Wisconsin. Ask for the series of "Wartime Care and Operation Posters." State quantity desired.

FLEXIBILITY



Flexibility is well illustrated by the work piece above — an actual job on a tough bronze housing done by a No. 4 Vertical Miller at the plant of the Norton Co., Worcester, Mass.

Sensitive hand control of the table and cross slide movements for milling the contours and bosses shown, made it possible to greatly improve production time on this piece.

Speed and flexibility, with other features below, gives the No. 4 Vertical Miller a plus-value in any shop!

ELECTRONIC

No. 4 REED-PRENTICE VERTICAL MILLER

CENTRALIZED CONTROL
INFINITELY VARIABLE FEEDS
WIDE RANGE SPINDLE SPEEDS
ELECTRONIC CONTROL FOR FEEDS
SUITABLE NEGATIVE RAKE MILLING
FILTERED AUTOMATIC LUBRICATION

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

MACHINE TOOLS

REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

NEW YORK OFFICE:
75 West St., New York 6, N. Y.
CLEVELAND OFFICE:
1213 W. 3rd St., Cleveland 13, Ohio

WITH ALCOA IMPACT EXTRUSIONS

. . . so little gives you so much

You start with that aluminum slug. One wallop of the press and there's the shell. Expand its top to a circle, cut the threads, and the part is ready for its cap. An Alumilite finish (process patented) adds to its good looks.

With Alcoa Aluminum impact extrusions, you have high speed production at its best. Very little machining is required. Metal is sound and uniform, giving great dependability. Ribs, bosses and other projections may be included.

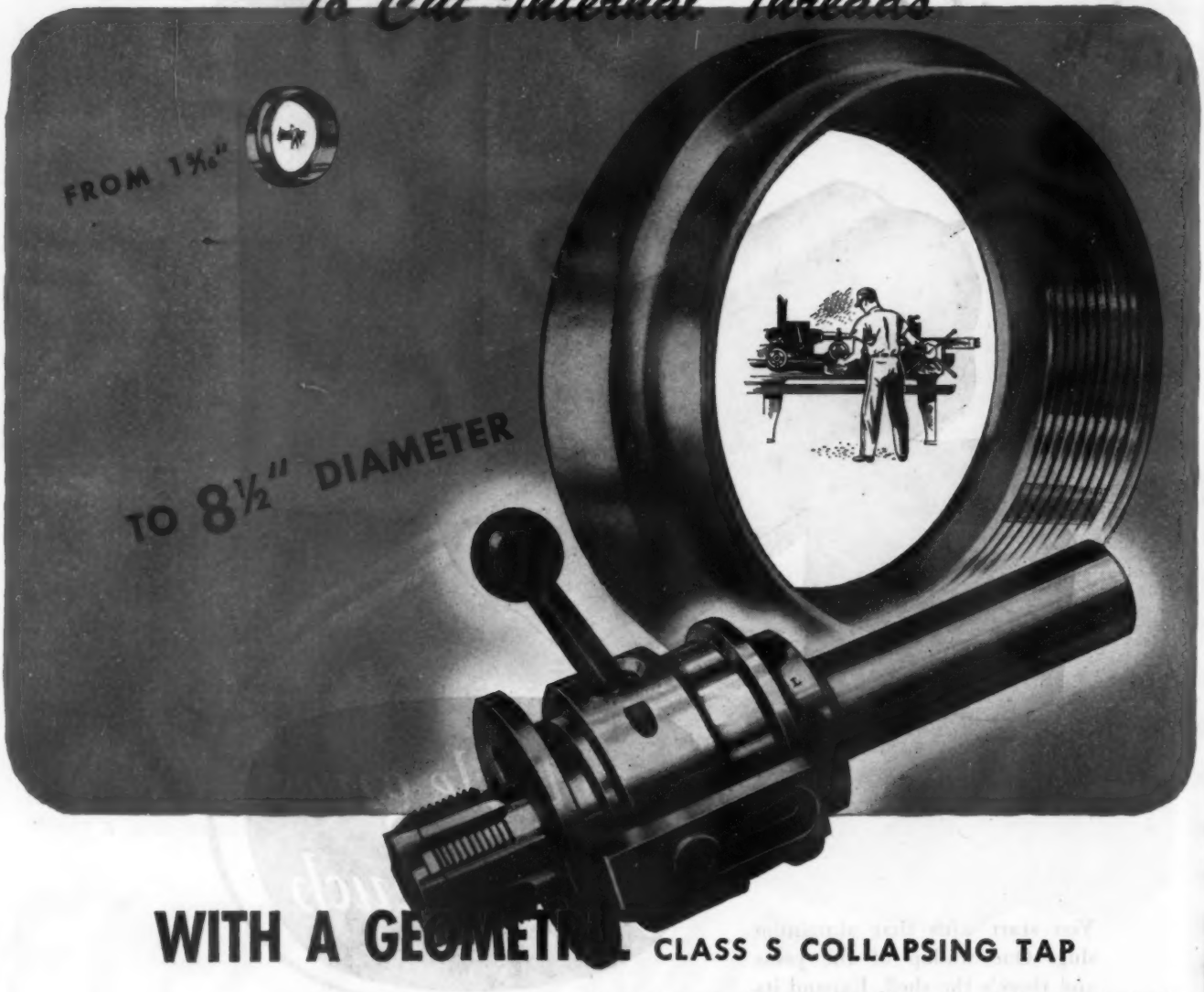
A slight change in design may permit a part to be made as an impact extrusion. Production is speeded up. Costs are cut. Our engineers will gladly help you determine what products are adaptable to the process. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IT'S SIMPLE

To Cut Internal Threads



WITH A GEOMETRIC CLASS S COLLAPSING TAP

There's no elaborate or expensive tooling up needed to cut internal threads over 1¼" diameter when you use a GEOMETRIC CLASS S Collapsing Tap.

It's a *universal* tap — easily adapted for use on almost any type of machine — hand screw machine or turret lathe, drill press or rotary spindle machine, automatic screw machines, chucking or threading machines, etc. You can use the SAME TAP on all of them — *if it's a Geometric!*

Each size cuts a WIDE RANGE of diameters and pitches. There are 11 sizes of Geometric Class S Collapsing Taps — covering threads from 1 5/16" to 8½" diameter in straight threads; 1" to 7" in Pipe Threads.

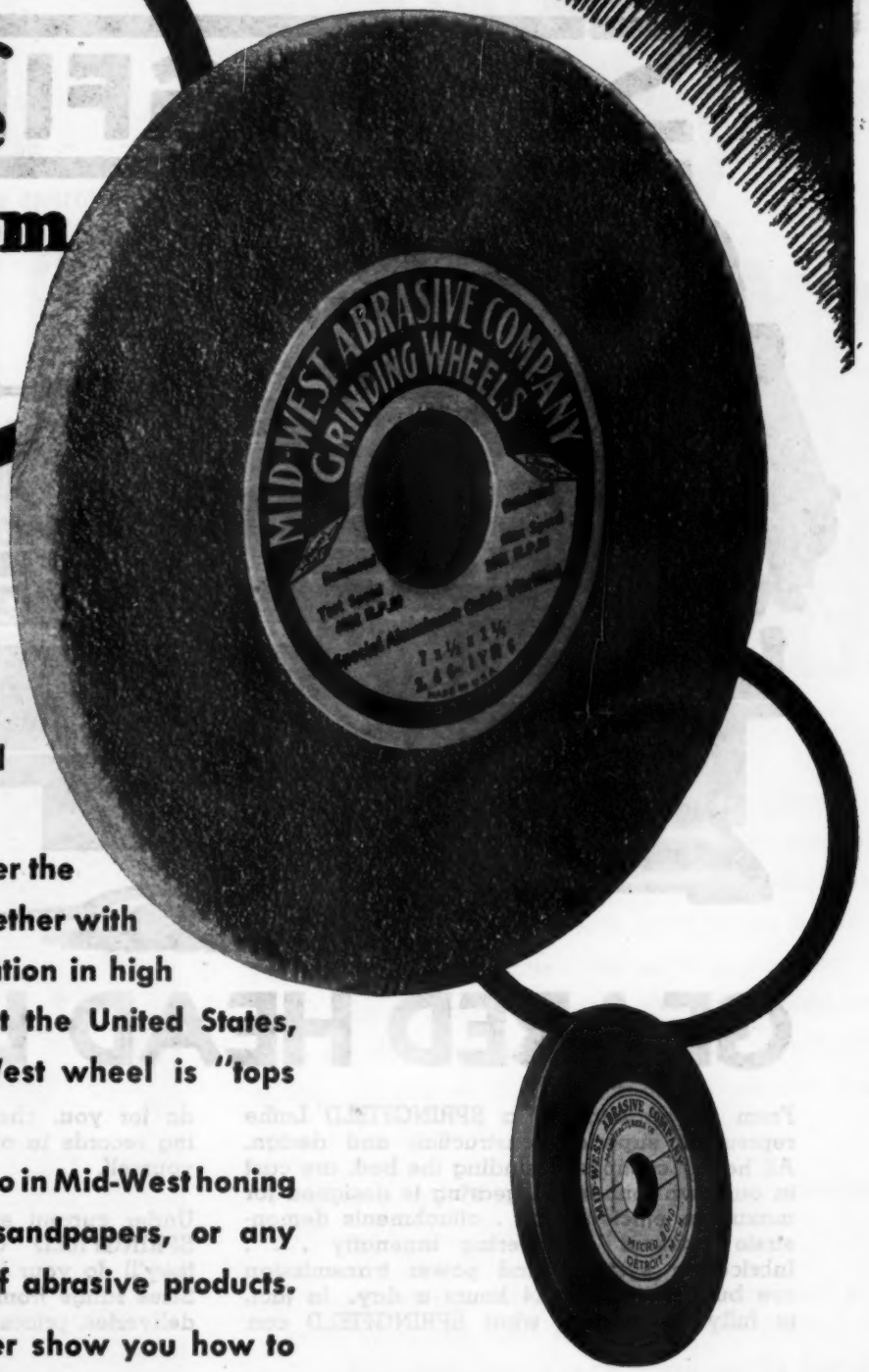
It's simple to do *fast, precision threading* with a GEOMETRIC CLASS S Collapsing Tap. The solid, sturdy chasers are rigidly supported their entire length and have a positive, split-second collapse that speeds work. Ample chip space for smooth cutting.

IF YOU CUT INTERNAL THREADS OVER 1¼" DIAMETER WRITE TODAY FOR COMPLETE INFORMATION ON GEOMETRIC CLASS S COLLAPSING TAPS

The GEOMETRIC TOOL COMPANY
New Haven 15 Connecticut

A DIVISION OF THE GREENFIELD TAP and DIE CORPORATION

"Tops" for the Tool Room



The new tool room grinding wheel of the Mid-West Abrasive Company clearly shows its superiority in high speed tool steel operations.

Test after test, conducted under the most rigorous conditions, together with many months of actual operation in high production plants throughout the United States, demonstrate that the Mid-West wheel is "tops for the tool room."

You'll find this exemplified also in Mid-West honing stones, sharpening stones, sandpapers, or any of Mid-West's broad range of abrasive products.

Let a Mid-West field engineer show you how to solve your abrasive problem.

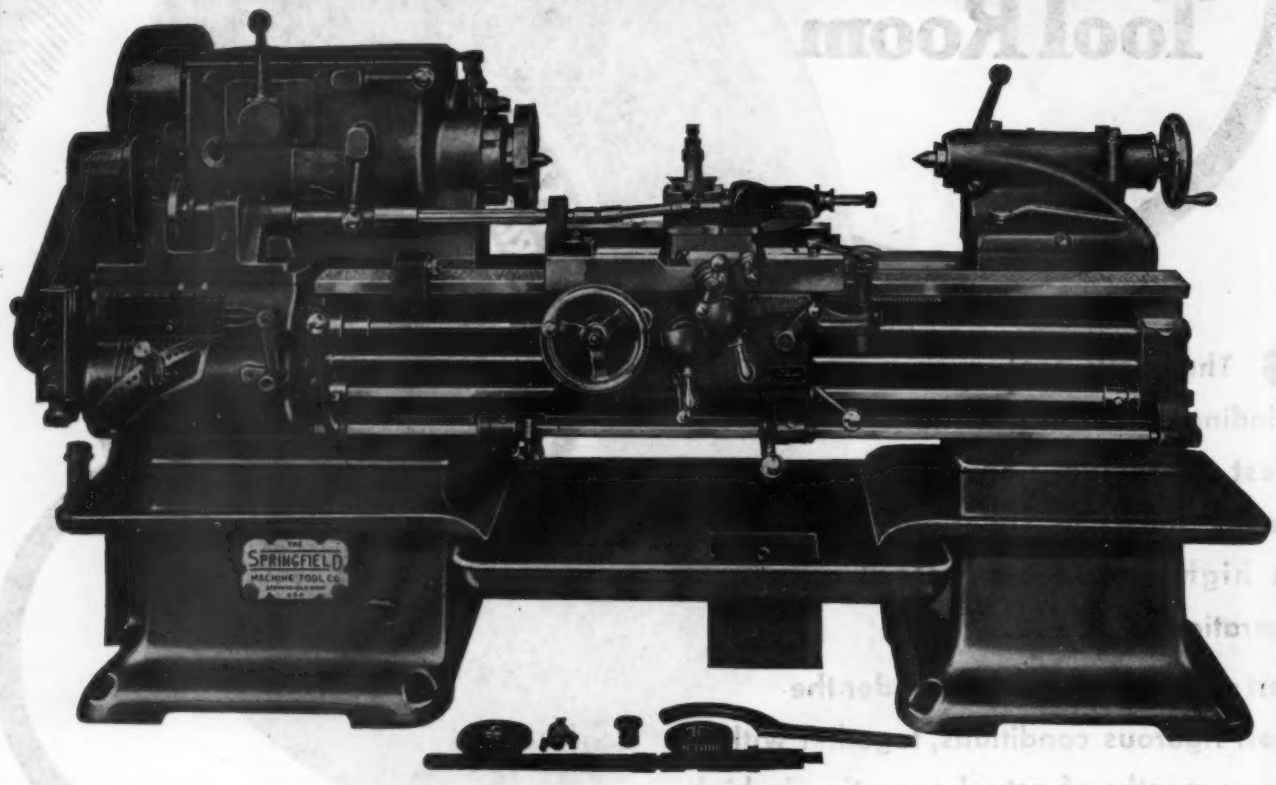
MID-WEST ABRASIVE CO.

Manufactures of DEPENDABLE Abrasives

Owosso, Mich. • Detroit • Rochester, Pa.

Choose

SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own foundry . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

Here's
the sure
way to maintain
accuracy on precision
boring, drilling and tapping operations

FOSDICK
JIG BORER

ARMY (E) NAVY

● The job illustrated is typical of the versatility and accuracy of the Fosdick Jig Borer. There are four holes bored; 2—.250", 1—.625", and 1—.498" and three screw holes spotted with work in this position. For the second operation the work is mounted on angle plate by means of a sub plate and positioned by a pin through one of the holes previously bored. In this position a 17/64" hole is drilled and three other holes tapped.

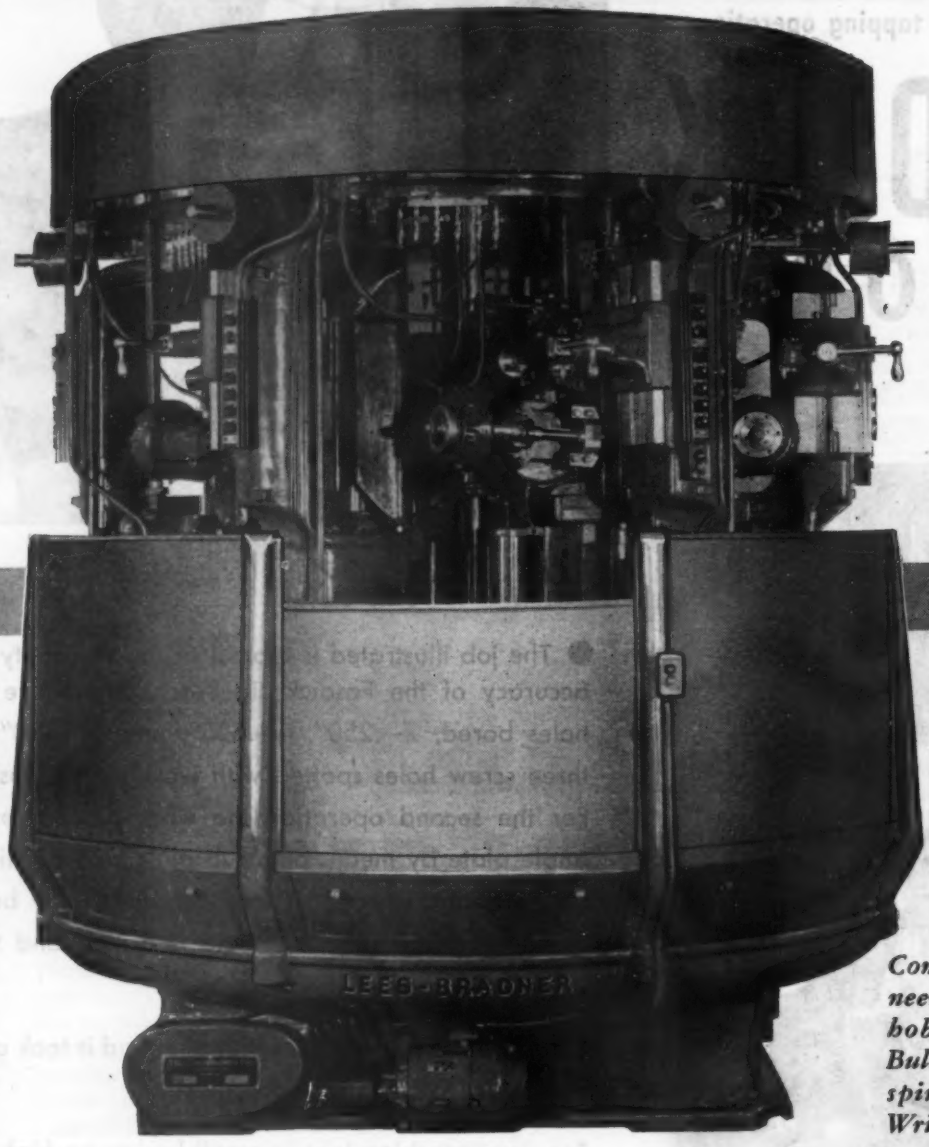
There were only 11 pieces in the lot and it took about 1½ hours to complete each piece.

For your precision jobs in small lots or on high production work you can depend on the Fosdick Jig Borer. ***For detailed description write for Jig Borer Bulletin J. B. A.***

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

THE LEES-

Automatic Rotary Gear Hobbing Machine

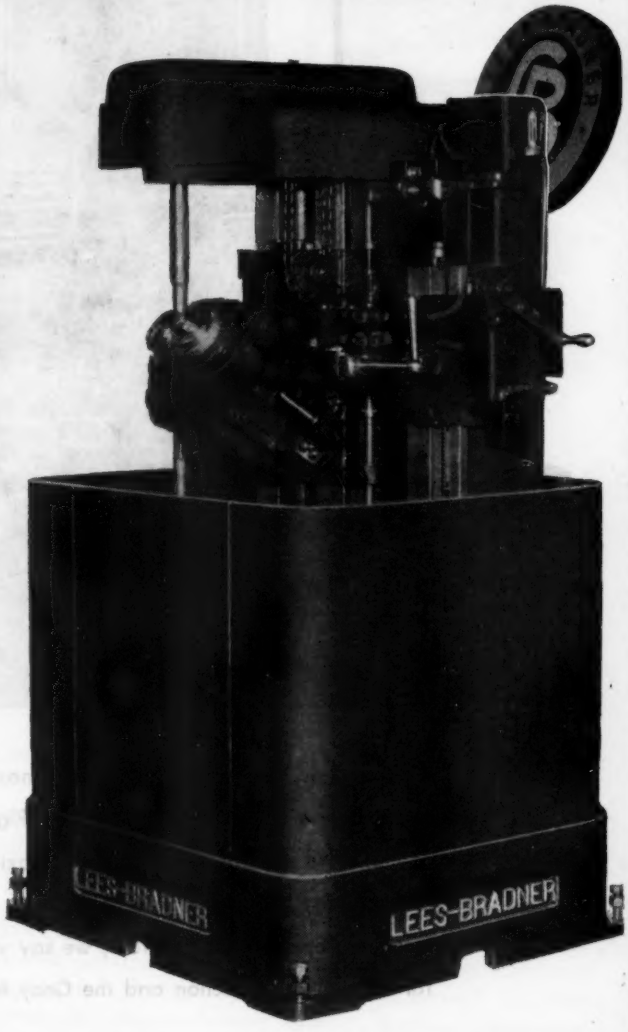


Consult a Lees-Bradner engineer on your precision gear hobbing and spline work. Bulletins on this and single spindle models available. Write for yours.

● Here's a high speed hobber that is particularly designed for the mass production of accurate gears—splines and similar work. It is built in four—six—or eight spindles and may be arranged for the production of the same job or several different jobs—climb or conventional cut. Lees-Bradner pioneered this construction and it has proved most successful in the production of precision gears and spline work in large quantities.

S-BRADNER

7-A Single Spindle *Automatic* Production Hobbing Machine



● This hobbing machine was designed and built for automatic continuous heavy production. It represents over thirty years of effort in the development of finer more accurate gear hobbing equipment. Suitable for spur gears, helical gears, sprockets, plunge cut or straight spline shaft serrations and cam shaft gears. It is adaptable to either conventional or climb cutting and available with an automatic hob in-out mechanism.

The **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO, U.S.A.

POWER · RIGIDITY · CONVENIENCE · *Characterize* GRAY MILLING MACHINES

● You need all three qualities for maximum production. Power without Rigidity will cause poor work and short tool life. Rigidity without adequate Power means that you cannot drive modern cutting tools at maximum speeds, feeds and depth of cut, but Power and Rigidity without Convenience will result in wasted man hours and consequent inefficient operation. Therefore, we say you must have Power, Rigidity and Convenience for Maximum Production and the Gray Milling Machine has all three.

THE G. A. GRAY COMPANY

3610 WOODBURN AVENUE • • • CINCINNATI 7, OHIO, U. S. A.

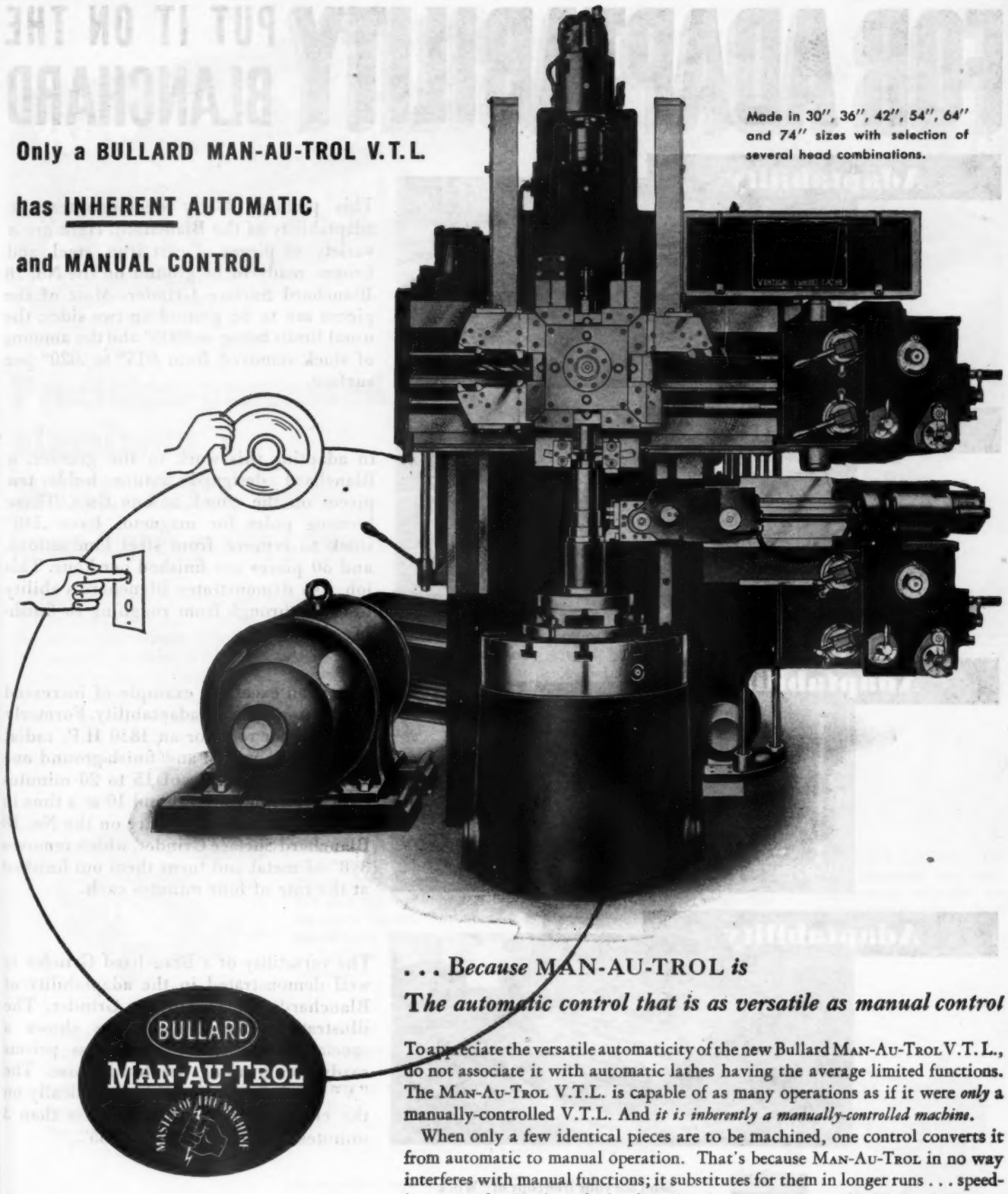
THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

Only a BULLARD MAN-AU-TROL V.T.L.

has INHERENT AUTOMATIC

and MANUAL CONTROL

Made in 30", 36", 42", 54", 64" and 74" sizes with selection of several head combinations.



BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE

. . . *Because* MAN-AU-TROL *is*

The automatic control that is as versatile as manual control

To appreciate the versatile automaticity of the new Bullard MAN-AU-TROL V.T.L., do not associate it with automatic lathes having the average limited functions. The MAN-AU-TROL V.T.L. is capable of as many operations as if it were *only* a manually-controlled V.T.L. And *it is inherently a manually-controlled machine.*

When only a few identical pieces are to be machined, one control converts it from automatic to manual operation. That's because MAN-AU-TROL in no way interferes with manual functions; it substitutes for them in longer runs . . . speeding up production by reducing lost time between cuts . . . eliminating human or cumulative error. That's why, when only a few pieces are to be produced, the advantages of automatic machining may so outweigh the slightly longer setup time that it will be more economical to utilize MAN-AU-TROL operation.

For further details about the way the Bullard MAN-AU-TROL V.T.L. *profitably* adapts itself to diversified shop schedules, write for Bulletin A.

The Bullard Company, Bridgeport 2, Connecticut.

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

FOR ADAPTABILITY PUT IT ON THE BLANCHARD

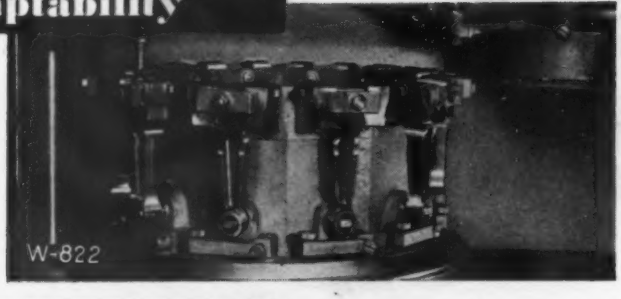
Adaptability

This picture clearly demonstrates the adaptability of the Blanchard. Here are a variety of pieces of cast iron, steel, and bronze ready to be ground on the No. 18 Blanchard Surface Grinder. Most of the pieces are to be ground on two sides, the usual limits being ± .0005" and the amount of stock removed from .015" to .020" per surface.

Adaptability

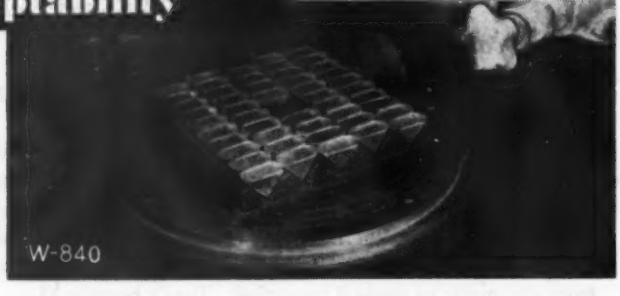
In adapting this work to the grinder, a Blanchard designed fixture holds ten pieces on the chuck at one time. These housing poles for magnetos have .140" stock to remove from steel laminations, and 30 pieces are finished per hour. This job also demonstrates Blanchard's ability to carry through from roughing to finishing operation.

Adaptability



This is an excellent example of increased production through adaptability. Formerly these master rods for an 1830 H.P. radial engine were milled and finish-ground one at a time at the rate of 15 to 20 minutes each. Now they are ground 10 at a time in a Blanchard special fixture on the No. 18 Blanchard Surface Grinder, which removes 3/8" of metal and turns them out finished at the rate of four minutes each.

Adaptability



The versatility of a Blanchard Grinder is well demonstrated in the adaptability of Blanchard No. 11 Surface Grinder. The illustration directly opposite shows a special fixture load of 48 glass prisms ready for grinding the hypotenuse. The "V" block fixture is held magnetically on the chuck. Grinding time is less than 3 minutes and stock removal .085".

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

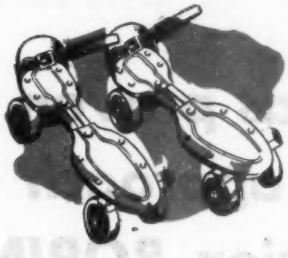
How UP-TO-DATE are you on ALUMINUM?

Precision-processed aluminum WIRE, ROD, BAR insure higher quality products

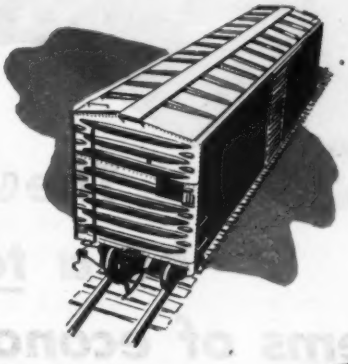
WHETHER YOU'RE BUYING STOCK for forging or machining . . . whether it's R317 or any of the other aluminum alloys . . . Reynolds can save you production time and money, help insure better quality finishes.

What's more, because of Reynolds complete quality control, tolerances are extremely close. No time is lost in re-setting machines; no material wasted in unnecessary rejects.

CORNER IN STOCK ROOM at one of the Reynolds plants. Here Rod and Bar carefully catalogued await your order. The moment you receive them, they're ready to go... heat-treated rod and bar for automatic screw machines or stock for forging . . . each item carefully inspected, fully identified.



STRONGER . . . LIGHTER, TOO! The Roller skates your kid uses after Victory will be stronger, lighter, more durable, because of parts machined or formed from Reynolds Aluminum.



WEIGHT SAVER! Today, aluminum box cars, designed by Reynolds, are lighter and stronger . . . built to take constant punishment.

Consider Aluminum . . . Consider the added efficiency offered by the new Reynolds aluminum alloys. Consider . . . ease of fabrication . . . thermal and electrical conductivity . . . light weight . . . corrosion resistance . . . strength . . . reflectivity . . . non-magnetic, non-sparking and non-toxic qualities . . . pleasing appearance . . . new low costs. And finally, consider Reynolds nation-wide production and service facilities. Reynolds Metals Company, Aluminum Div., 0000 S. Third Street, Louisville, Ky. . . . *Consider Aluminum* . . . **Consult Reynolds**

See catalog in Sweet's . . . or write for catalog No. 100-A "Reynolds Aluminum . . . Its Important Role in Tomorrow's Products;" and Special Bulletin 31-A on Reynolds Wire, Rod, Bar.

REYNOLDS METALS

REYNOLDS ALUMINUM

The Great New Source of

INGOT • SHEET • SHAPES • WIRE • ROD • BAR • TUBING • PARTS • FORGINGS • CASTINGS • FOIL • POWDER

7648-A1-6

JIGMIL YOUR WORK

JIGMIL—The world's finest BORING and milling machine is made in Detroit.

Typical of milling and BORING work done with great economy on the JIGMIL. Hole centers held to within .0002"

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling of tool and production work

THE fastest producing and most accurate machine in the field.

Many users are reporting consistent experience of two to three times the output and higher quality work.

Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch).

Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work.

Unique operation and controls that make possible high precision work with relatively little skill.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

Takes the Tough Jobs...in Stride!

Marathon 850-A Cutting Oil meets the most exacting specifications for difficult, heavy duty work . . . deep drilling, tapping, threading

Why let those extra-heavy jobs be a headache . . . the deep drilling, tapping, threading that are too tough for a general purpose cutting tool?

Marathon 850-A Cutting Oil was *made* for 'em. Precision compounded to meet the most exacting specifications for heavy duty work:

- *It flows freely to the point of contact (just the right viscosity)*
- *Absorbs and dissipates heat rapidly*
- *Balanced sulphur content increases its anti-weld characteristics*
- *Reduces smoke to a minimum or eliminates it entirely*
- *No sludging . . . longer tool life . . . better finish.*

Those aren't just "claims". They're the experience of users in many busy plants. Marathon 850-A Cutting Oil is worth looking into, right away. Write, wire or phone, ask for an Ohio Oil Lubrication Engineer to call—with the facts.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION

MARATHON

The OHIO OIL Company

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

PRODUCERS OF PETROLEUM SINCE 1887

Snyder Special runs 375 PIECES HOURLY ON 12-OPERATION CYCLE

Performing 12 successive operations upon a brass sprinkler head body, this two-way horizontal machine, designed and built by Snyder, produces 375 parts an hour at 80% efficiency.

The part is a brass casting without previous machining and operations are drilling, reaming, hollow milling and threading on one end, and, hollow milling, facing, drilling and tapping the other end, plus assembling and spinning in place a pressed metal deflector of which there are three sizes and shapes.

The work-piece is loaded manually into a double-jaw screw chuck actuated in loading position by hydraulic cylinders. Six of these fixtures are mounted on a trunnion which is indexed 60° station to station.

Each station has separate slide and spindle motor and each spindle has separate hydraulic control. Hydraulic power for slides and clamping mechanism is supplied by a hydraulic power unit set behind the machine.

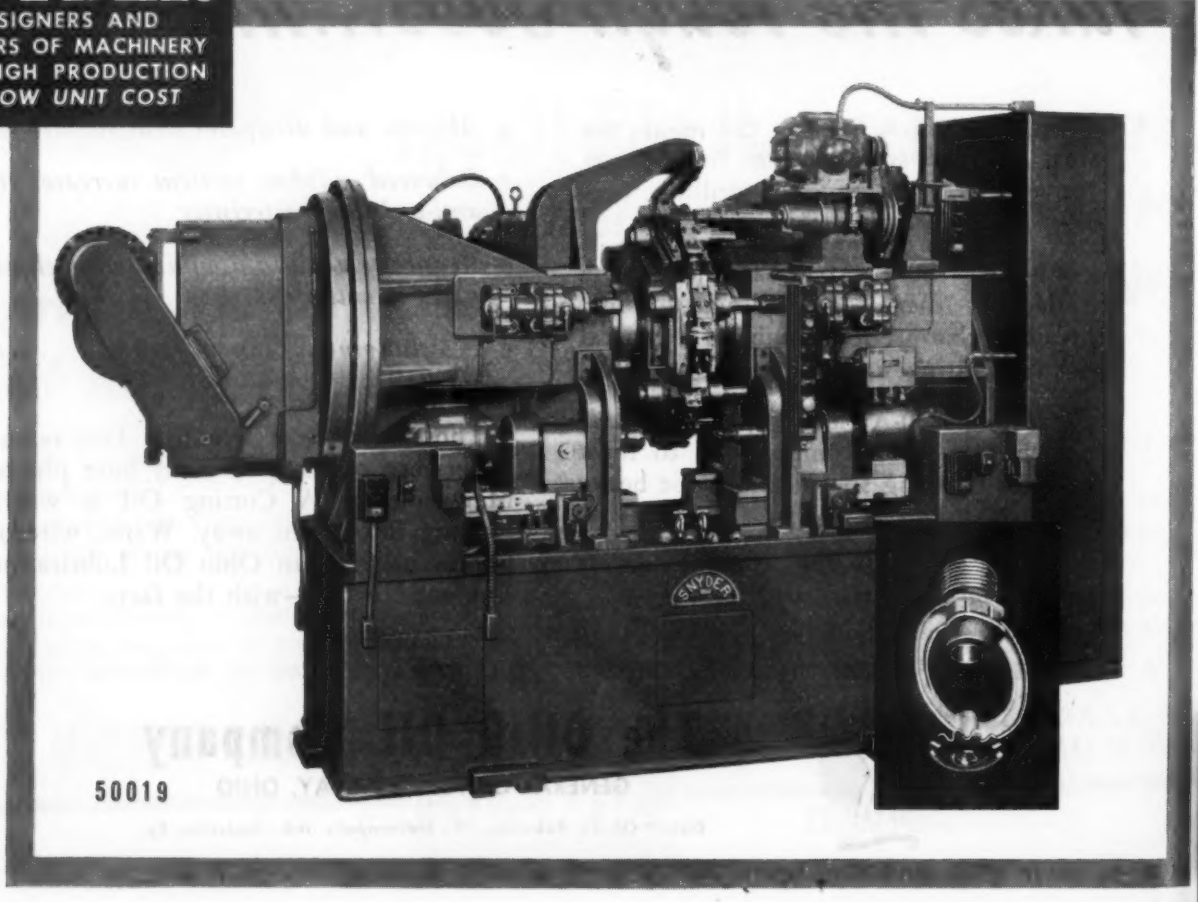
The index mechanism is mounted at the left end of the machines and keyed to the trunnion fixture through a heavy trunnion shaft.

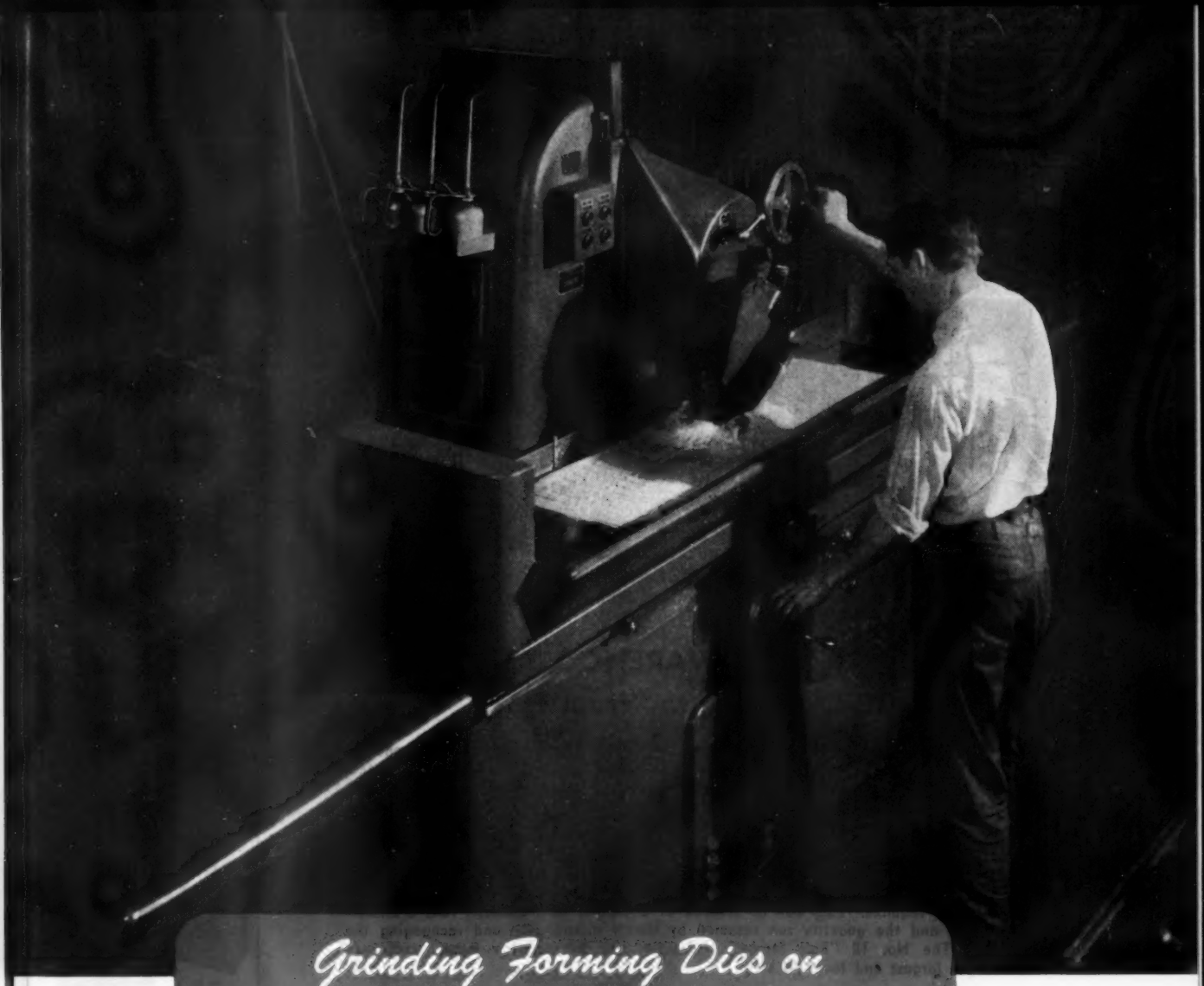
Machine base and trunnion bearing housing are welded steel. Index mechanism housing and hydraulic slide bases are cast iron. Slides are hardened and ground steel. Because operations are on brass, no coolant is provided.

The economies of this type of machine include reduced handling and operator fatigue, accurate control of precision, finish and time cycle, use of unskilled help, increased safety. Is your production department equipped with modern, time-saving, cost-reducing production units? Perhaps Snyder can help you too. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Cooperation with Leading American Industries





Grinding Forming Dies on

THOMPSON GRINDER

A large electrical manufacturer uses this Type "B"— 12" x 40" Thompson Grinder to grind Blanking and Forming Dies. On the various jobs handled the material runs from cast iron to tungsten steel and metal removed from .125" to .002" depending on the job.

On the blanking die shown they are maintaining tolerances of —.0005 inch. The work is held by magnetic chuck and the floor to floor time is 10 minutes which includes an average loading and handling time of 5 minutes.

Thompson Grinders are being used extensively throughout industry where accuracy—smooth finish—and high production is essential. Consult Thompson Grinder on your precision grinding work.

FURNISHED IN SIZES FROM 6" x 18" TO 36" x 240" IN TYPES BEST SUITED TO YOUR WORK

THE **Thompson** GRINDER CO.

SPRINGFIELD, OHIO

NOW CRUCIBLE STEEL WAREHOUSES DELIVER

—*any size, any length "from stock"*

With their modern high speed MARVEL Hack Saws the Crucible Steel Company's Warehouses can deliver orders "from stock," whether for a few miscellaneous lengths, a thousand alloy steel gear blanks, a single tool steel disc 18 inches in diameter, or other lengths or slices accurately cut-off from any type bar stock.

In their Indianapolis quick service Warehouse shown above they have two No. 9A MARVEL Automatic Bar Feed Sawing Machines (capacity 10" x 10") and one No. 18 MARVEL Universal Roll Stroke Hydraulic Saw (capacity 18" x 18"). The high speed 9A will cut-off identical pieces from single or nested bars automatically with no more operator attention than an automatic screw machine requires. They can be stopped at any point in a quantity run; a miscellaneous cut made; and the quantity run resumed by simply disengaging and reengaging the automatic feed. The No. 18 "Roll Stroke" Hydraulic Saw handles the heavy stuff—will quickly cut-off the largest and toughest bars.

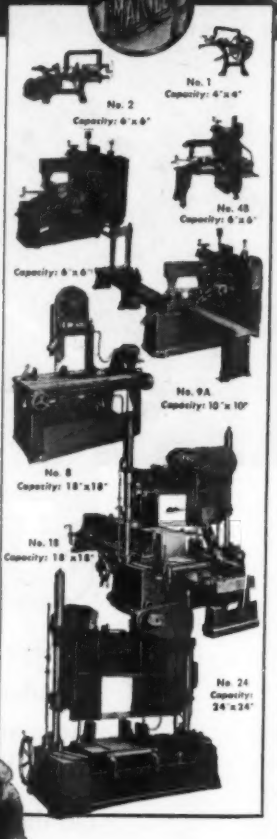
The Crucible Steel Company, like many others, have found the MARVEL Hack Saw method fast, accurate and economical; and that it requires no special skill on the part of the operator. For quick reference see our section in Sweet's File—Mechanical Industries or write for catalog.

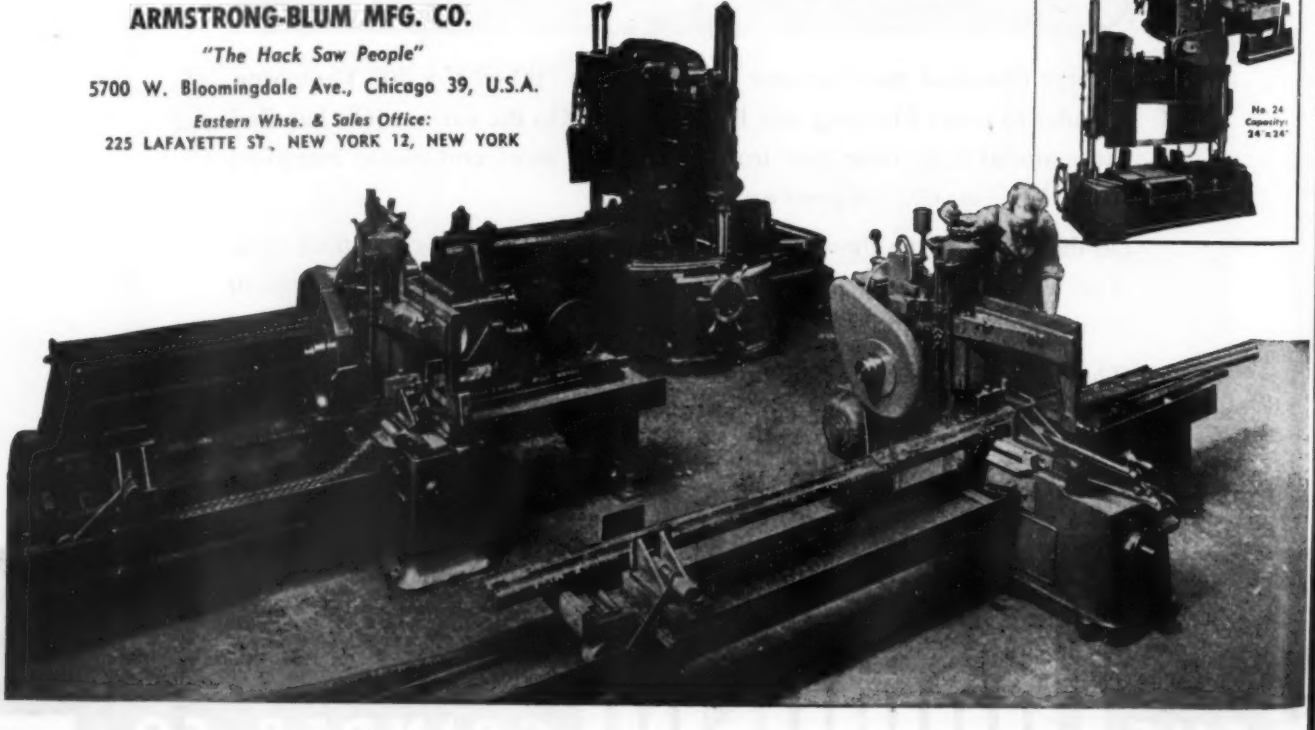
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave., Chicago 39, U.S.A.

Eastern Whse. & Sales Office:
225 LAFAYETTE ST., NEW YORK 12, NEW YORK





HERE'S WHY YOU GET

PRECISION ACCURACY and LOWER TOOL COSTS with the STAPLES EXPANSION REAMER

Precision accuracy in reaming, to .0001 inch, plus lower tool cost, result from the use of the Staples Expansion Reamer with its exclusive, patented expansion feature.

To expand the Staples Reamer, simply drive in the tapered expansion plug. This forces the tool body outward, as shown in the cross-sectional view above, and tilts backward the tips of the cutting blades, so that new, accurate cutting edges are presented. No regrinding is necessary—tool life is prolonged—tool cost reduced.

In the Staples Expansion Reamer the tool body is solid—not slotted. This provides rigidity, accuracy and uniform expansion not obtained in conventional expansion reamers.

Made originally to meet the precision standards of the aircraft industry, Staples Tools are now available for general use. Send today for the Staples catalog of quality cutting tools, including *standard tools available from stock.*

Staples Tool & Engineering Company
Cincinnati 25 . . . . . Ohio

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

AUTHORIZED DISTRIBUTORS

Albany, Sager-Spuck
Baltimore, L. A. Benson
Birmingham, Quinn & Quinn
Boston, Arthur A. Crafts
Brooklyn, A. N. Nelson
Buffalo, R. C. Neal Company, Inc.
Charleston, Cameron & Barkley (Branches, Jacksonville, Miami, Tampa)
Chicago Screw Machine Supply
Cincinnati, E. A. Kinsey
Cleveland, Strong, Carlisle & Hammond
Dallas, Machinery Sales & Supply
Denver, Mine & Smelter Supply
Detroit, Sterling Supply
El Paso, El Paso Saw & Belting Supply
Erie, Neal & Co.
Houston, G. F. Cotter Supply
Knoxville, W. S. Murrian
Los Angeles, Machinists' Tool & Supply
Memphis, J. E. Dilworth
Minneapolis, John C. Eide
Muskegon, Muskegon Hdwe. & Supply
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Tulsa, Marshall Supply & Equipment
Waterbury, White Supply
Waterville, Harold W. Kimball

EVERY DEMAND FOR SAVINGS IS BEING MET . . .

. . . in "The Tools You Buy Again"

Small tools — at the business ends of machines working to capacity — must be capable of making time, labor and material savings in order that production demands be met. UNION TOOLS are meeting such demands in the countless plants turning out war materiel. They are saving time by faster cutting — saving labor by requiring less resharpening — conserving material by assuring accuracy and minimizing spoilage.

The ability of UNION TOOLS to make savings is traceable to an in-built fineness of quality which in turn is the result of UNION'S long, specialized experience in small tool development.

For the sake of savings, it will pay you to standardize on UNION.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

•

UNION
TWIST DRILL COMPANY
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

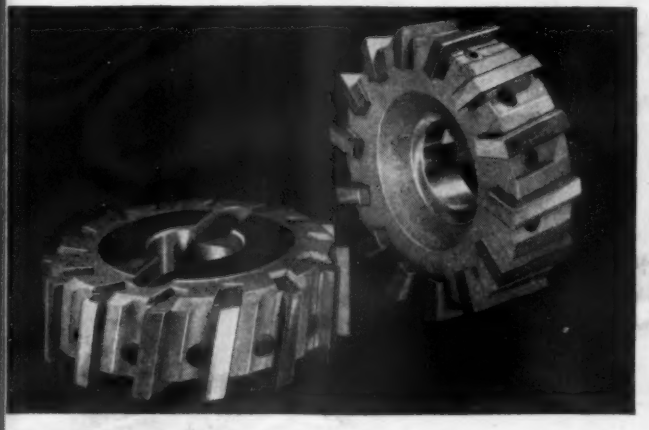
MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

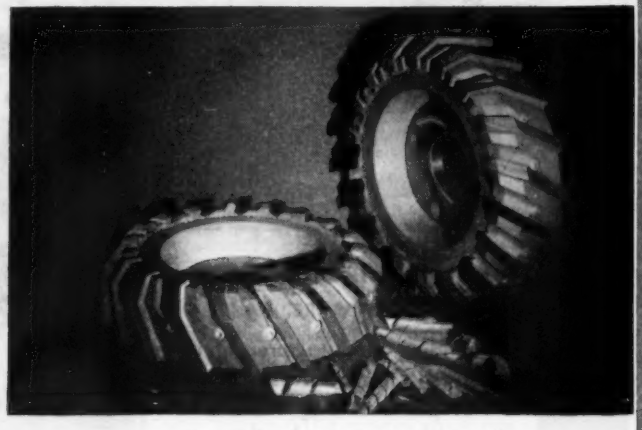
Ingersoll FACE MILLS

WHEN TO USE EACH OF FOUR BASIC DESIGNS

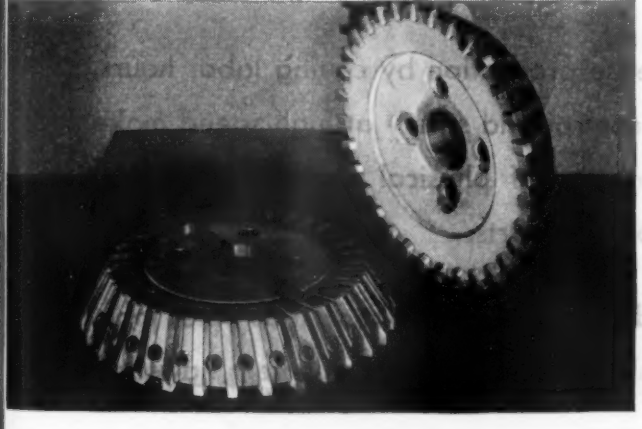
INGERSOLL presents four standard types of face mills, each designed for a particular class of work. All types are furnished with high speed steel, cast alloy, or carbide tipped blades; and are available in medium, heavy, and extra heavy series to accommodate different amounts of stock. Send us a complete description of your particular operation so we can recommend the proper series. Ask for a field engineer to call and make a survey of your requirements.



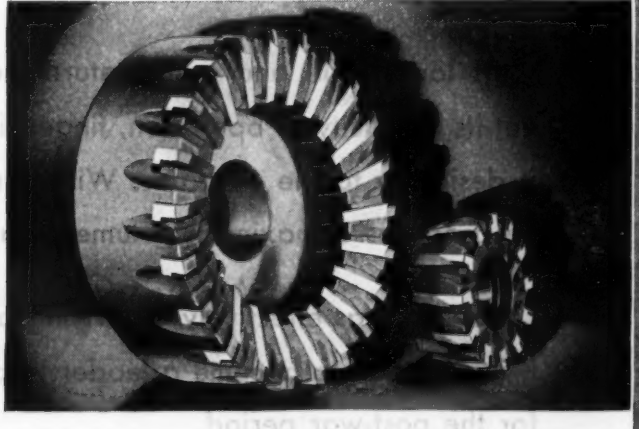
TYPE NX is a general purpose face mill recommended where a cutter of general application is required capable of taking heavy cuts on both face and periphery in cast iron and steel. There is no cutter which we can recommend as being more generally useful for medium and heavy milling.



SHEAR CLEAR is a patented face milling cutter designed particularly for continuous chip materials. The discovery of new blade angles makes possible faster feeds, smoother finish, longer tool life and less power required. Will outperform any other face mill on flat surfaces. Will not cut into a corner.



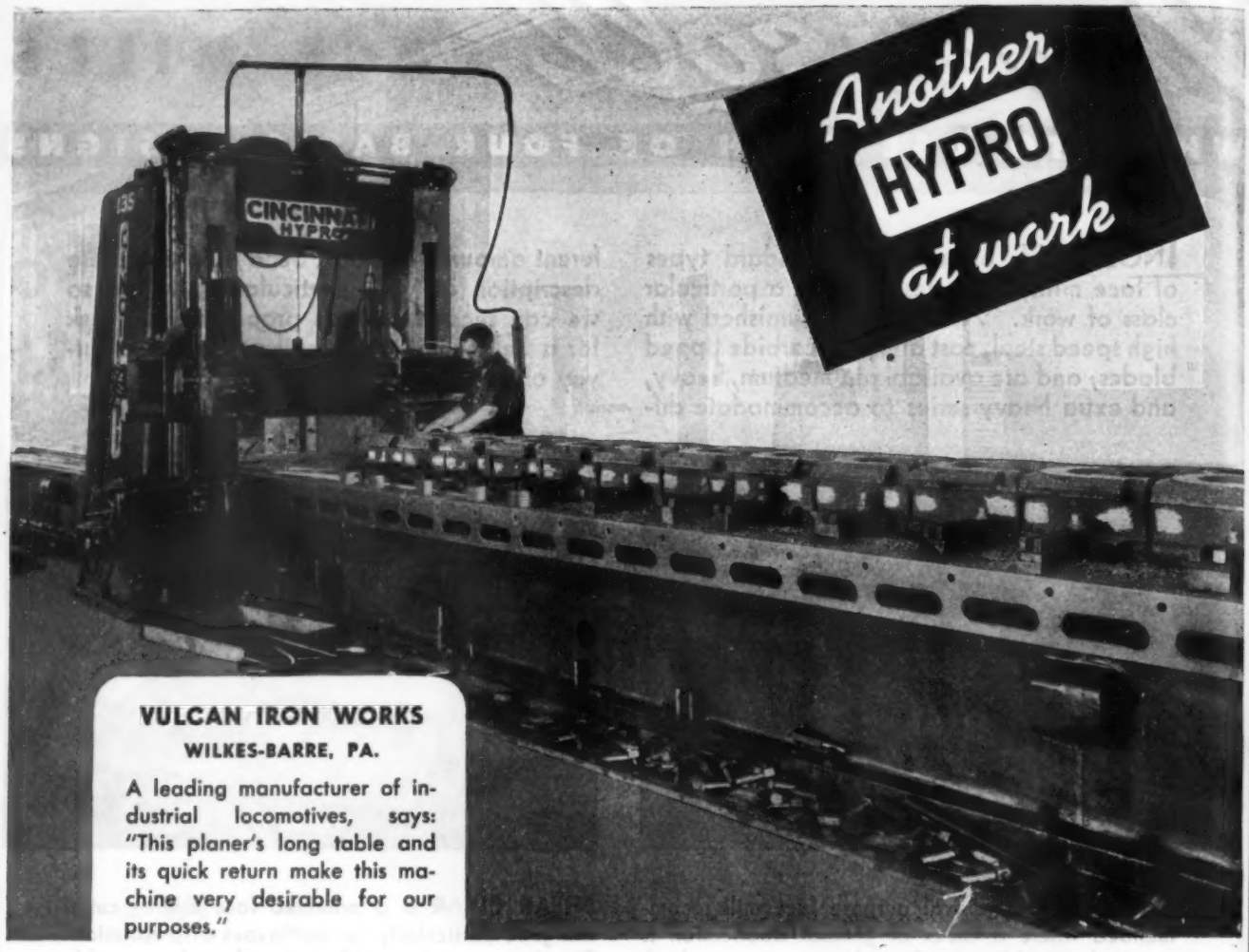
CONE TYPE face mills are widely used general purpose cutters with lowest replacement blade cost. Suitable for small steps and shoulders. Medium duty used extensively for high production milling of cast iron, and extra heavy duty suitable for heaviest cuts on cast iron or steel.



RAY BLADE face mills are intended for high production milling of cast iron. Particularly recommended for use with Rexalloy or other cast alloy blades. Both roughing and finishing types available with interchangeable blades.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

Manufacturers of Inserted Blade Milling and Boring Tools



VULCAN IRON WORKS
WILKES-BARRE, PA.

A leading manufacturer of industrial locomotives, says: "This planer's long table and its quick return make this machine very desirable for our purposes."

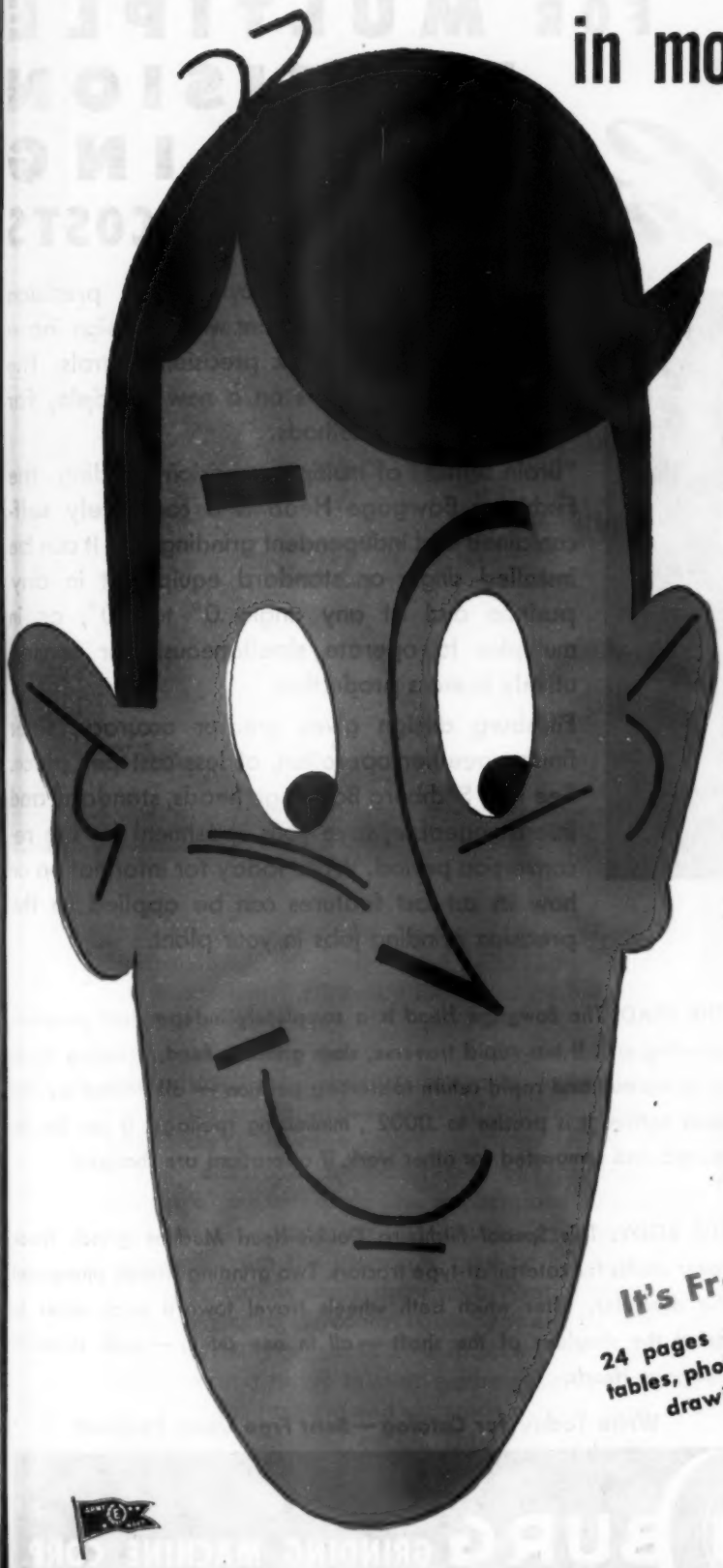
FACING off locomotive driving boxes with precision—at a very profitable speed.

Its long table and quick return increase production by cutting labor hours, yet its simplicity of operation, finger-tip control and safety at high speed make it desirable to the operator. With a minimum of physical and mental strain, he produces a maximum volume of approved parts.

Used just as effectively on driving and connecting rods, as well as other jobs, it is designed to become a leader in profit making in the planer field now and for the post-war period.

THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

How to be well read on the latest in motor-generator sets!



. . . full of up-to-the-minute information you should have, this book—"Robbins & Myers MOTOR-GENERATOR SETS"—covers mounting construction of 4-bearing sub-base, 2-bearing union-ring, and vertical union-ring sets, motor and generator voltages, mechanical features, ratings, and dimensions. In short, it contains the latest detailed data gathered from forty years of R&M motor-generator development.

By illustration, chart, and table, it gives you all the facts on fractional horsepower sizes from 50 to 500 watts and on integral types from 750 to 5000 watts.

Send for your copy, now. Write the Motor Division. Ask for Book No. 1881.

It's Free

24 pages of text, tables, photographs, drawings!

ROBBINS & MYERS • INC. MOTOR DIVISION · SPRINGFIELD, OHIO
In Canada: Robbins & Myers Co., of Canada, Ltd., Brantford, Ont.

MOTORS · HOISTS · CRANES · MACHINE DRIVES · FANS · MOYNO PUMPS · FOUNDED 1878

THIS HEAD FOR MULTIPLE PRECISION GRINDING *Cuts* PRODUCTION COSTS

Mass production can be applied to precision grinding only with equipment whose design incorporates simple, automatic precision controls. The Fitchburg method works on a new principle, far superior to other methods.

"Brain center" of multiple precision grinding, the Fitchburg Bowgage Head is a completely self-contained and independent grinding unit. It can be installed *singly* on standard equipment in any position and at any angle 0° to 90°, or in multiples to operate simultaneously or consecutively in mass production.

Fitchburg design gives greater accuracy, finer finish, speedier operation, at less cost per piece. See *how* Fitchburg Bowgage heads, standard and interchangeable, save your investment for the reconversion period. Write today for information on how its cut-cost features can be applied to the precision grinding jobs in your plant.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Special Fitchburg Double-Head Machine* grinds track roller shafts for caterpillar-type tractors. Two grinding wheels plunge-cut the diameter, after which both wheels travel toward each other to grind the shoulder of the shaft — *all in one set-up — with standard Bowgage Heads.*

Write Today for Catalog—Sent Free Upon Request

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

a new standard line of electrode assemblies for dielectric heating . . . 2, 5, and 10 kw

Built in 2, 5 and 10-kw sizes, these Westinghouse electrode assemblies offer new convenience and efficiency for dielectric heating of plastic preforms.

The assemblies may be mounted on standard generators, or matching networks, and the electrodes are interchangeable within the physical limits of the cage.

Top electrode is perforated to minimize moisture condensation. In applications where moisture condensation is unusually severe, warm air from the generator may be bled into the cage. This is easily done with Westinghouse generators using air-cooled tubes. Top electrode's height is easily adjusted by a knob on the cage. Ball joint and spring take-up assure positive contact between preform and electrode regardless of material and heating cycles. Interlock switches remove high voltage from bottom electrode when cage is opened.

Available in electrode diameters from 4" to 15", depending on kw rating, these newest contributions to effective radio frequency heating may also be built in special designs, on order. Ask your nearest Westinghouse office for the facts. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-08115

FREE... an authoritative, pocket-size reference book on radio frequency heating. Contains extensive tables, charts and formulas on both induction and dielectric heating. Ask for reference book B-3574 on your business letterhead, please.

Westinghouse

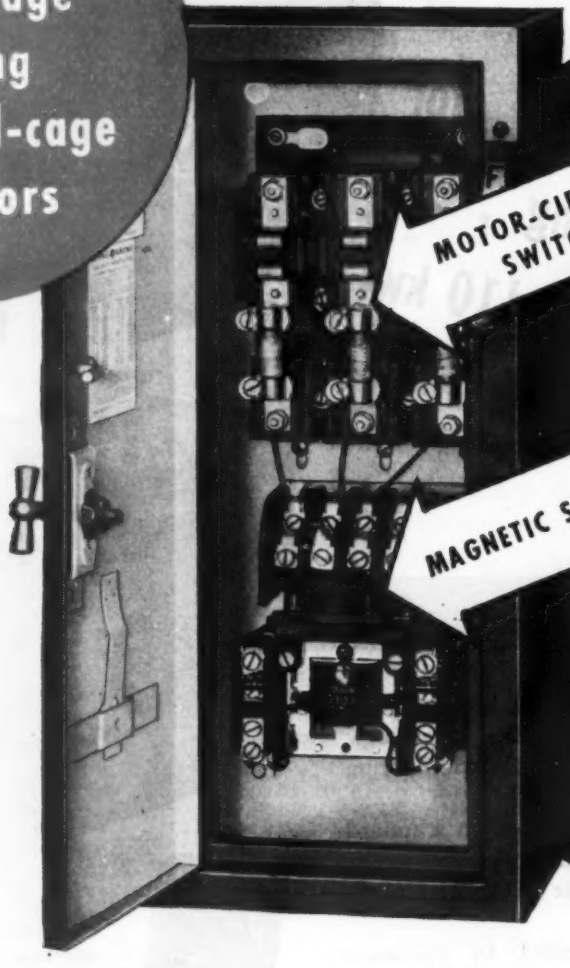
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at Work

MOTOR STARTERS

for full-voltage starting of squirrel-cage a-c motors

★ DEPENDABLE ★ ATTRACTIVE IN



TWO DEVICES IN ONE UNIT

6 WAYS TO SAVE BY USING COMBINATION STARTERS

1. **SAVE MONEY**—List price slightly more than for two separately mounted devices, but the difference is more than made up by the savings in wire, conduit, fittings, and installation costs.

2. **SAVE ORDERING TIME**—Instead of buying two separately mounted devices, you buy one factory co-ordinated unit that controls and protects your motor.

3. **SPEED UP INSTALLATION**—Users report a 50 per-cent reduction in mounting time, a 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You connect to only 9 terminals—not 15.

4. **SAVE WALL SPACE**—You can mount combination starters in small, unused places either near to or remote from the operator.

5. **CONSERVE MAN POWER**—By eliminating one complete mounting job on every installation, you save valuable man power.

6. **SAVE CRITICAL MATERIALS**—Combination starters have less copper wire, steel conduit, and fittings than separately mounted devices.

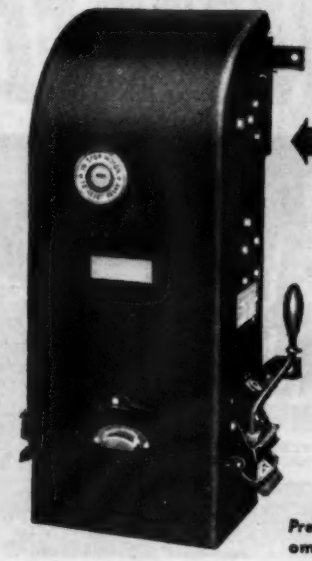
—AND THEY SAVE YOUR MOTORS, TOO. The fuses, or the breaker, are co-ordinated with the thermal overload relays to give complete motor protection under short-circuit or overload conditions.

EVERY TYPE, EVERY SIZE, FOR EVERY MACHINE APPLICATION

PPEARANCE ★ DESIGNED TO BLEND WITH MODERN MACHINES

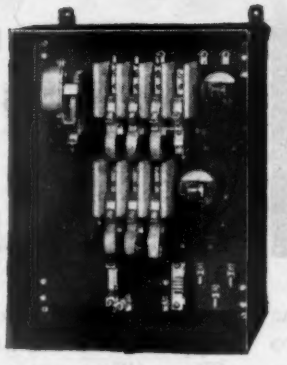
Manual and Magnetic Starters

Reduced-voltage Magnetic Starter—These starters are recommended for polyphase induction motors driving pumps, conveyors, compressors, etc. Available in ratings from 5 to 900 hp at all standard voltages and frequencies.



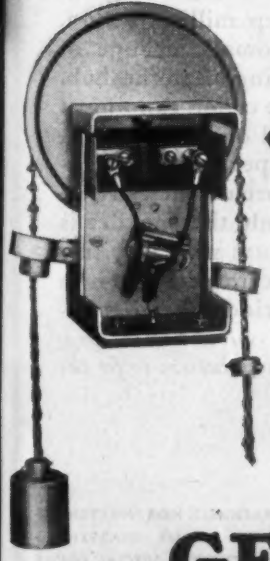
Reduced-voltage Starter—A manual, autotransformer-type starter for squirrel-cage induction motors. Undervoltage protection provides safety for the operator and the driven machine.

Primary-resistor Magnetic Starter—Well adapted for squirrel-cage induction motors on geared or belted drives where a sudden application of full-voltage torque must be avoided. Although the magnetic starter shown is of the general-purpose type, other enclosures are available for different operating conditions.



Pressure Governor—Recommended for the automatic control of motor-driven pumps, air compressors, and similar applications. The governor is designed to handle the control circuit of any standard G-E d-c or a-c automatic starter rated up to and including 300 amperes. Above 300 amperes, it is necessary to insert a control relay.

Accessories



Float Switch—Suitable for use in the control circuit of a-c or d-c automatic starters, and can directly handle the circuits of small motors. All float switches are dripproof and splashproof, and are suitable for outdoor installation when they are not subjected to snow or sleet.

WHAT IS YOUR APPLICATION?

G-E starters come in a variety of enclosures to meet any operating conditions in your plant. We'd like to send you any additional information you may want. And, remember, our engineers will be glad to help you select the correct type of starter for your needs. *General Electric Company, Schenectady 5, N. Y.*

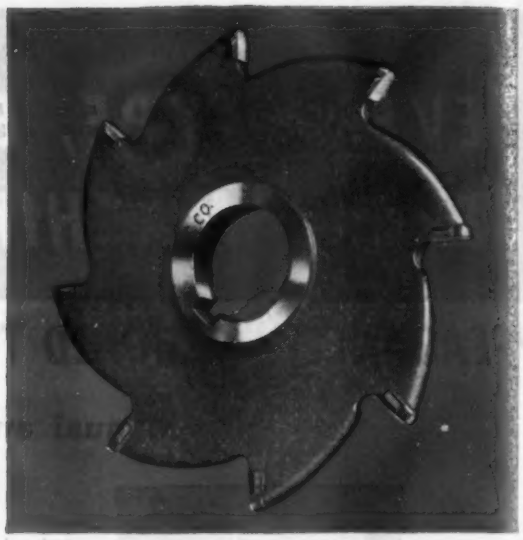
INDUSTRIAL CONTROL

Buy all the BONDS you can—and keep all you buy.

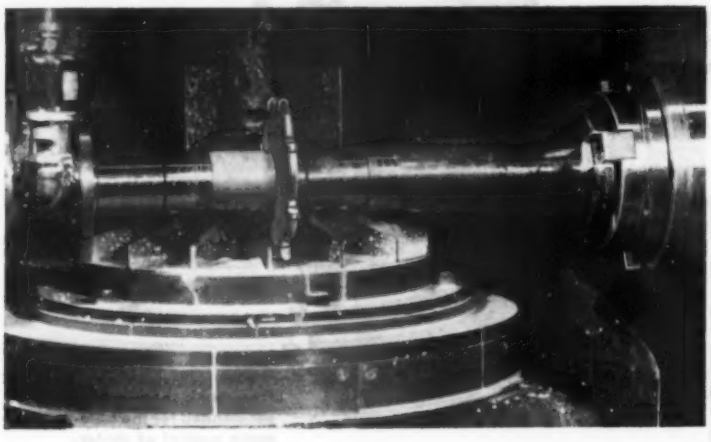
GENERAL ELECTRIC

676-135-8M10

SPECIAL PROFILE
CARBIDE TIPPED
MILLING CUTTER



BARBER-COLMAN
ENGINEERED MILLING CUTTERS



SWEEP MILLING 16 FINS OF SUPERCHARGER IMPELLER IN SIX MINUTES

With many thousands of superchargers to be produced as rapidly as possible in order to increase combat efficiency of our military aircraft, the reduction of machining time is an important problem. A principal part of the supercharger is the aluminum impeller forging with its radial fins. Between the fins are flat surfaces which narrow as they approach the hub and then slope upward. These surfaces not only must have a smooth finish but they must blend with a radius into the already finished surfaces on the sides of the fins . . . Barber-Colman Cutter Engineers tackled the problem of designing a cutter which would accomplish these results under high production conditions, and they coordinated their work closely with the milling machine manufacturer. The result is shown in the pictures above — a special carbide-tipped cutter designed to run at high speed. The milling machine has an oscillating fixture to produce the sweep milling action, automatic index, and automatic change of feed rate for heavier cutting near the hub. Climb cutting is used. The cutter, running at 1935 r.p.m. has a fast feed of 13″ per min., and a slower feed of 6″ per min. as it approaches the hub; the fixture oscillates at 86 strokes per min. As a result, the impeller is completed in only 6 minutes with very fine finish. The design of the cutter enables it to deliver 600 pieces per grind. *Let Barber-Colman Engineers help to solve YOUR production problems by designing cutters to fit the job conditions.*

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

Make
P&J RE-TOOLING
part of your conversion program

The tooling on the job shown here, specially designed to handle the work on a P & J 6 DRELX Automatic Chucking and Turning Machine, has met wartime needs for both speed and economy. Converted by P & J re-tooling for post-war requirements, it offers the means for cost-cutting which will be demanded by a highly competitive market.

...and meet the challenge of low-cost production

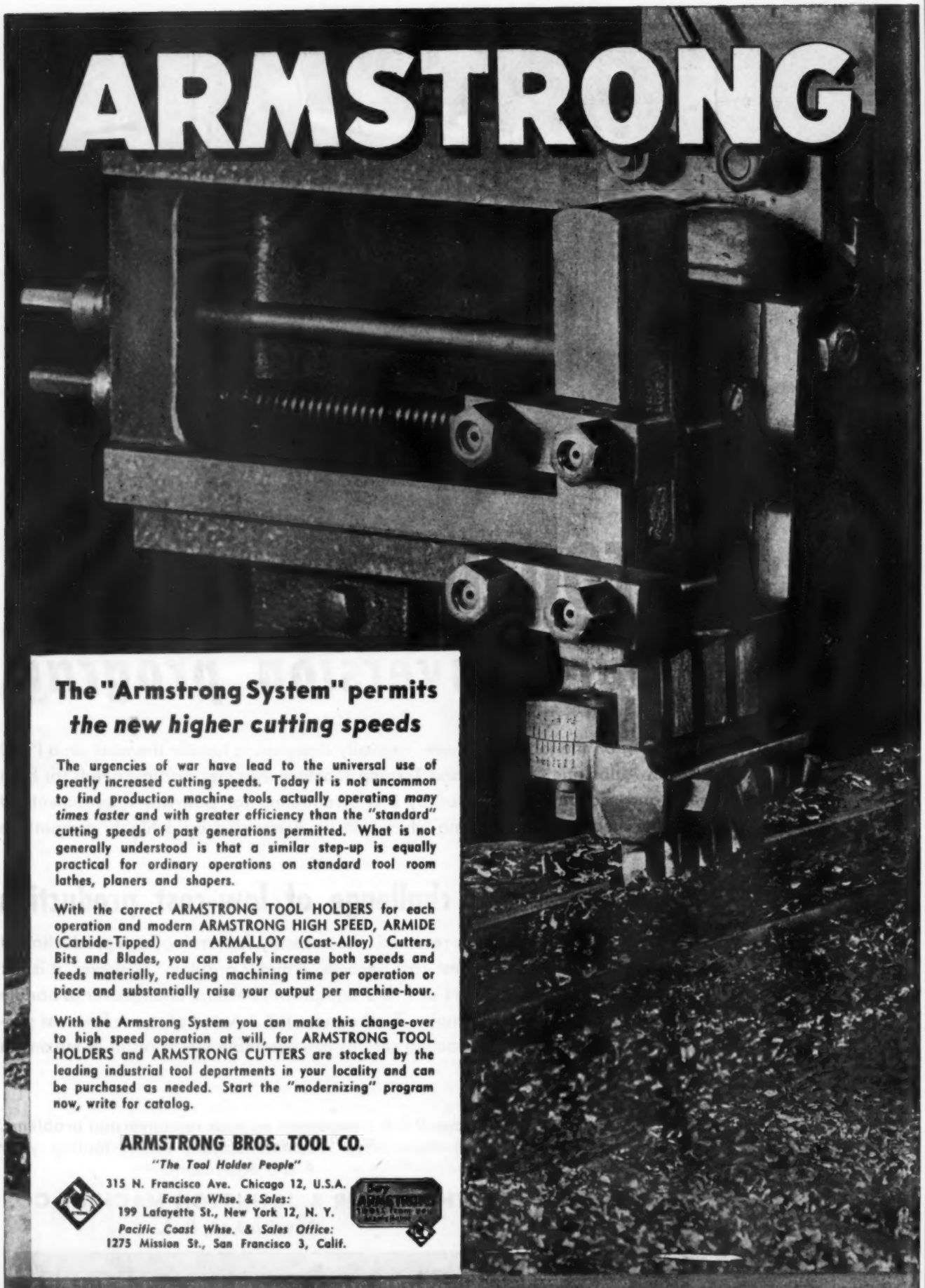
As peace time manufacture is resumed, the necessity for turning from production at any cost to production at lowest cost becomes a major problem. However, it is not a difficult one to solve for users of P & J equipment, because changeover to handle new work is comparatively simple. Furthermore P & J Automatics are low-cost producers on any work because tooling set-ups are available which result in maximum time and money savings.

Consult P & J engineers on your re-conversion problems. Let them offer recommendations for re-tooling your P & J equipment.

THE POTTER & JOHNSTON MACHINE CO.
Pawtucket, R. I.

BOND BUYING HELPS US AND HURTS OUR ENEMIES

ARMSTRONG



The "Armstrong System" permits *the new higher cutting speeds*

The urgencies of war have lead to the universal use of greatly increased cutting speeds. Today it is not uncommon to find production machine tools actually operating *many times faster* and with greater efficiency than the "standard" cutting speeds of past generations permitted. What is not generally understood is that a similar step-up is equally practical for ordinary operations on standard tool room lathes, planers and shapers.

With the correct ARMSTRONG TOOL HOLDERS for each operation and modern ARMSTRONG HIGH SPEED, ARMIDE (Carbide-Tipped) and ARMALLOY (Cast-Alloy) Cutters, Bits and Blades, you can safely increase both speeds and feeds materially, reducing machining time per operation or piece and substantially raise your output per machine-hour.

With the Armstrong System you can make this change-over to high speed operation at will, for ARMSTRONG TOOL HOLDERS and ARMSTRONG CUTTERS are stocked by the leading industrial tool departments in your locality and can be purchased as needed. Start the "modernizing" program now, write for catalog.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave. Chicago 12, U.S.A.
Eastern Whse. & Sales:
199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office:
1275 Mission St., San Francisco 3, Calif.

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

RECONVERSION HELP

Pratt & Whitney engineers are ready to put their backlog of knowledge and experience to work for you on any or all of your tooling problems.

It may be only a small "hitch" in your plans . . . or it may be a major undertaking. But it may save time and money to call in Pratt & Whitney at the outset.

Our engineers are trained to tackle just the type of tooling problems you will run up against. That's their job, as it has been for years.

You can also frequently gain much help from the literature we have on hand concerning all our products . . . our machine tools, our long line of gages, and our comprehensive list of small tools. In fact, many of our customers have discovered new ways to cut corners and increase production simply by going through our catalogs. We will be happy to send you any of our literature you may request.

For your convenience, we are once again maintaining stocks of all standard small tools and gages at our branch offices. As your reconversion plans take concrete form, we are sure that this added convenience will help simplify your problems.

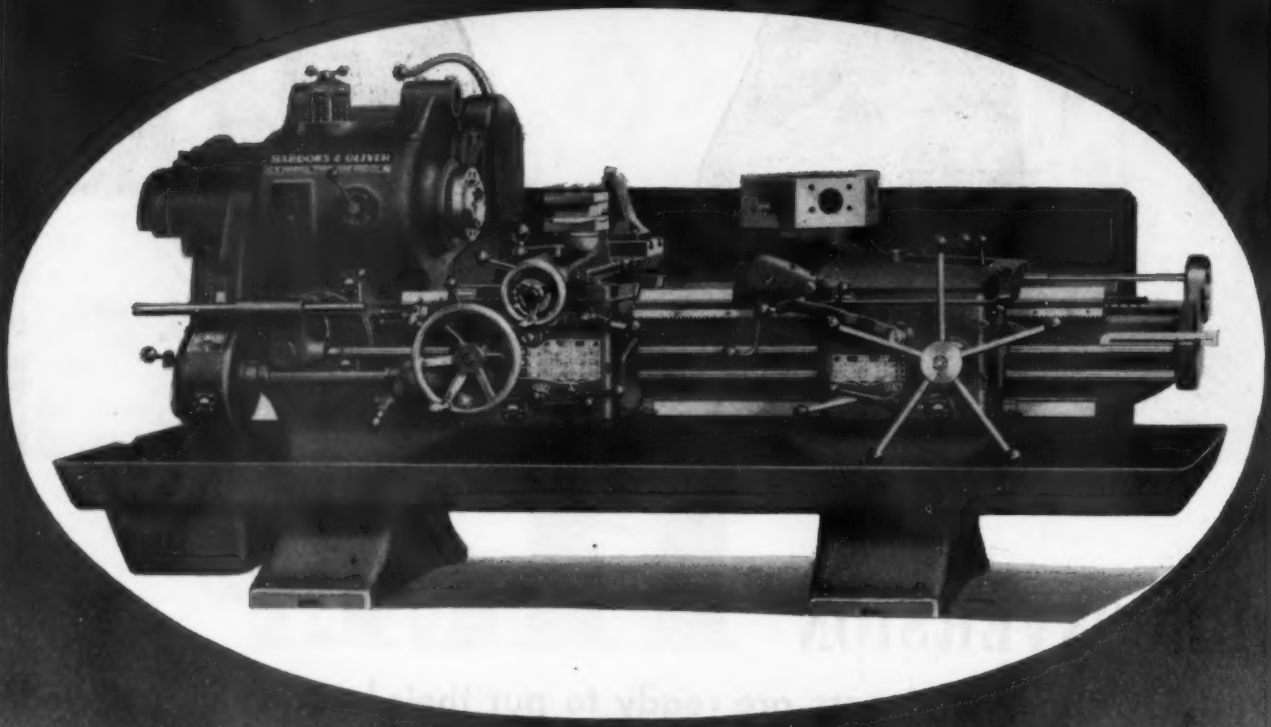
Please feel free to write or contact us at any time. Our entire organization is geared to give you the help you want, when you want it.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT

No. 21 *Saddle Type* TURRET LATHE



High Standards

OF WORKMANSHIP AND PERFORMANCE

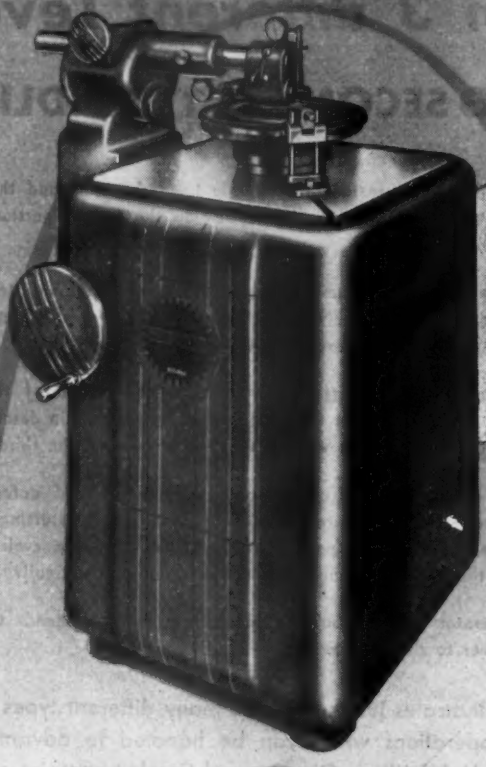
MAKE THIS BARDONS & OLIVER TURRET LATHE

AN OUTSTANDING INVESTMENT . . . .

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

CHECK GEAR ERRORS *ACCURATELY and QUICKLY*



RED RING INTERNAL GEAR CHECKER

Checks tooth spacing, eccentricity, pitch diameter and root diameter of internal spur or helical gears from 2 to 48 diametrical pitch and from 2" to 18" P.D. With auxiliary head, it will also check parallelism of internal spur gear teeth.

RED RING SPUR GEAR CHECKER

Checks eccentricity and tooth parallelism of spur gears especially for use at the cutting or shaving machine as a guide to the operator. It is furnished in three sizes: for maximum pitch diameters of 12", 18" and 24".

RED RING GEAR ROLLING FIXTURE. The work gear may be tested in mesh with its mating gear or with a master mating gear. Any deviation or error in the work gear is shown instantly on an indicator which is an integral part of the fixture. Various attachments can be furnished to suit the gear mounting.

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SPECIALISTS IN SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

RED RING PRODUCTS

Fully Automatic Milling on 3 different Levels

—IN ONE OPERATION, ELIMINATING SECONDARY HANDLING

THE drawing below shows a component made from SAE-4320. It will be observed that along the length of the piece there are three different outside diameters. On each of the O.D.'s a slot or keyway is milled. This means that a separate milling cut is performed on each of the three levels. This can be performed in one operation on the No. MM-1-5-2 U. S. Multi-Miller which is arranged with automatic vertical motion of the spindle head. The vertical motion of the spindle head and the longitudinal feed of the machine table are cam actuated to operate in synchronization with each other. The photograph shows a No. MM-1-5-2 U. S. Multi-Miller with the cover plate on the spindle head removed to show the mechanism employed to automatically raise and lower the head.

On this operation the cycle is as follows:

1. Operator loads piece in fixture.

2. Operator trips lever to start table feed (which is from right to left). The arrows on the drawing show the apparent motion of the cutter through the work.

3. Cutter enters work as shown and the milling cut on the section with smallest O.D. is performed.

4. The spindle head then automatically raises as the table is at rest and clears the cutter from the work. The table then resumes its movement to the left.

5. At the proper instant the spindle head descends and the cutter engages the work to mill the keyway on the central portion of the work piece.

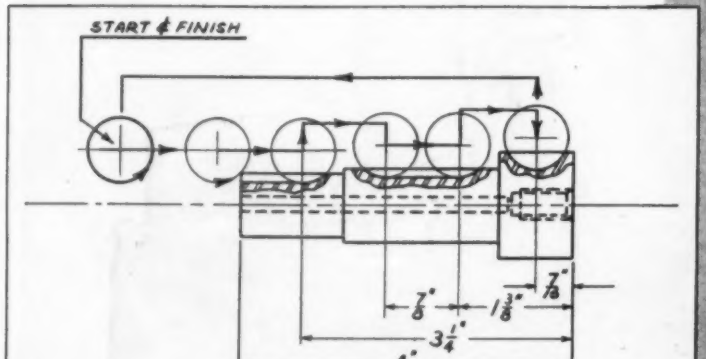
6. When this cut is completed the spindle head again raises as the table dwells. When the head has ascended to proper height for the next cut, the table movement to the left is again resumed.

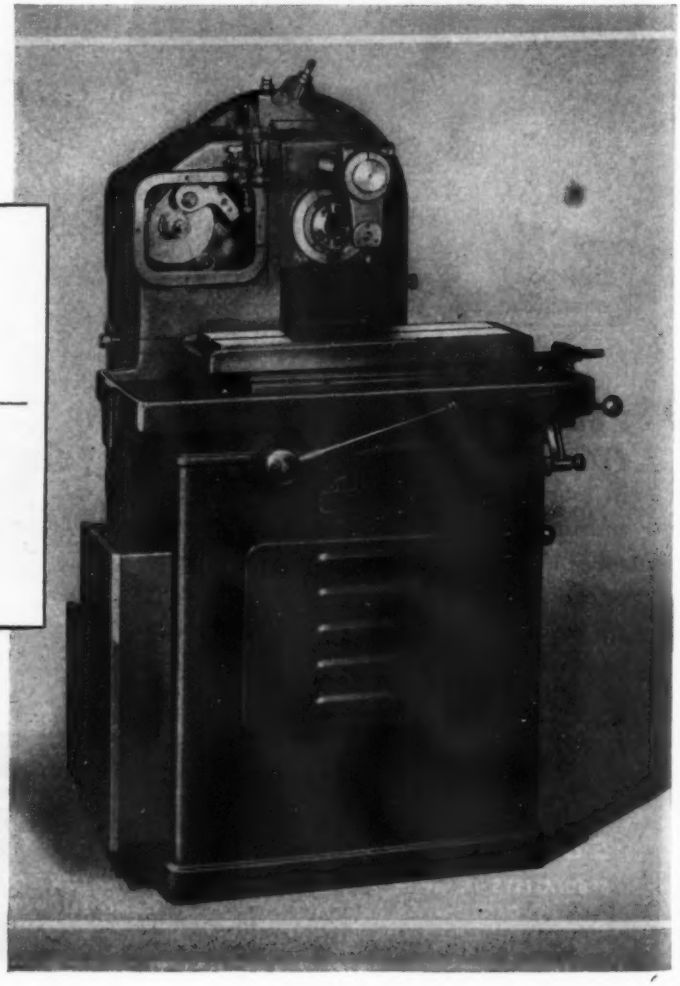
7. This brings the cutter over the right hand end of the piece (which has the greatest O.D.). The spindle head again descends and the cutter engages the work to mill the keyway on the third level.

8. At the completion of the cut the spindle head automatically raises and the table returns rapidly to the right to starting position and head descends to position ready to start the next cycle. At this point the table movement of the machine automatically stops.

9. Operator removes finished piece from fixture, reloads and trips the lever to start the next cycle.

This illustrates just one of the many different types of milling operations which can be handled to advantage on U. S. Multi-Millers. Our General Catalog contains complete specifications for these machines. *Ask for your copy.*





U. S. TOOL COMPANY, INC.
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U. S. Die Sets and Accessories
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Proved in War use—

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GULF QUALITY RUST PREVENTIVE

for each specific need!

Available now for protecting your surplus equipment

Every type specially suited to provide maximum protection

When you change over from swords to plow shares, make sure your surplus tools and equipment are properly protected against damaging rust.

From Gulf's complete line, you can select one or more war-proven rust preventives that will meet your every requirement for both interior and exterior use—and provide positive protection for indefinite periods.

Gulf quality rust preventives have given an excellent account of themselves in protecting all types of metal parts and war equipment during storage and transportation overseas. They meet Government specifications for exterior and interior application, and are available now for immediate delivery.

For further information on Gulf quality rust preventives, write, wire, or phone your nearest Gulf office.

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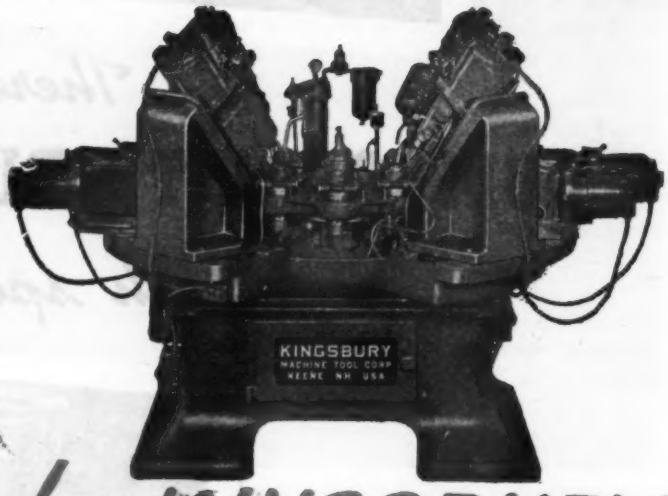
FLEXIMATIC

Demonstrates its Speed and Accuracy on Fuse Part Production

Drilling, counterboring and tapping brass fuse part components—doing the entire job in a single chucking of the work—producing 500 completed parts per hour! Jobs like this, that demonstrate FLEXIMATIC speed, simplicity and accuracy, are the reason why FLEXIMATICS are so widely chosen for intricate operations on munitions parts.

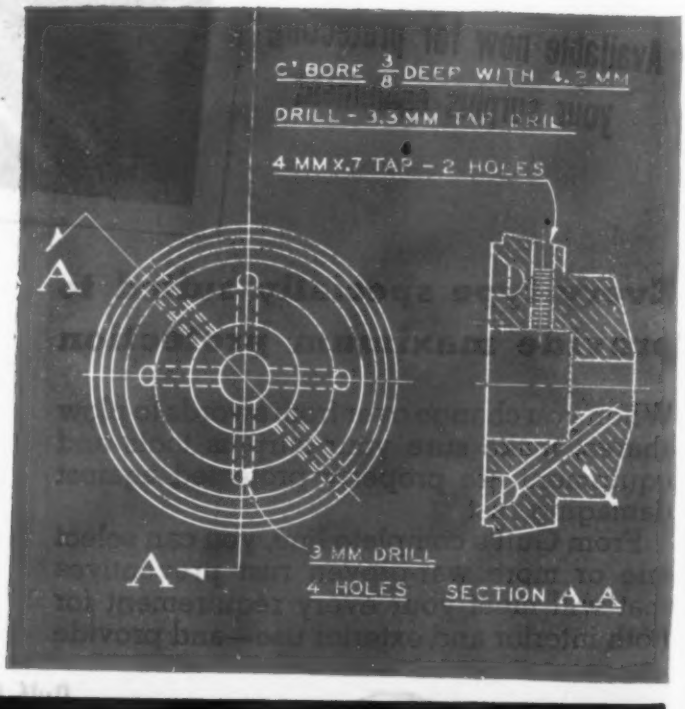
Kingsbury FLEXIMATICS are made up of standard units mounted on one of several types of standard bases. This method greatly lowers the cost of special machine construction and, in addition, permits changes to be readily made to meet changes in production. In the FLEXIMATIC illustrated, individual work holding fixtures in the turret are automatically indexed during the indexing of the main turret, thus presenting the part in various positions at the work stations so that all the operations are performed in a single chucking.

To meet the exacting standards of accuracy and the imperative need for speed in munitions production, choose FLEXIMATICS by Kingsbury!



by KINGSBURY

THIS IS A FLEXIMATIC MUNITIONS JOB!



KINGSBURY MACHINE TOOL CORPORATION
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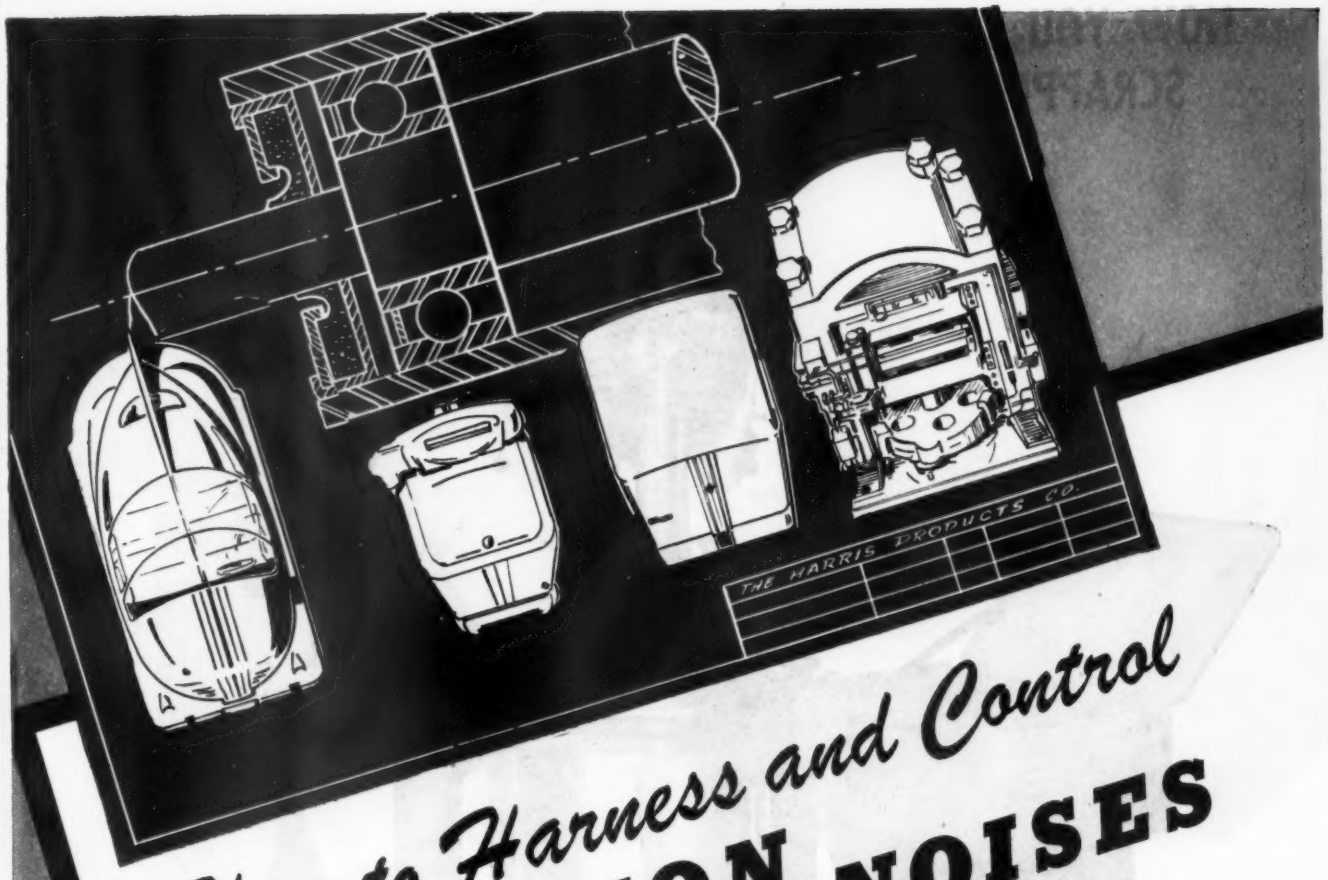

How to Harness and Control VIBRATION NOISES

Today, vibration control on postwar equipment is a major subject with most of the leading equipment and appliance manufacturers because it adds greatly to the longevity, efficiency and performance of their products. Vibration control also means quiet, smooth operation which in turn is a potent sales point in selling appliances of all kinds.

Harris *Torflex* Flexible Bearings will prolong life, lower maintenance costs, insure more dependable and accurate operation and increase efficiency. This is done by absorbing shock, controlling vibration, silencing noises, providing flexibility for cushion and misalignment, transmitting torque and eliminating wear and friction. *Torflex* Bearings take axial, torsional, and radial loads and come in a wide range of sizes, carrying loads from ounces to tons. They are widely used and universally approved.

Harris pioneered in the field of engineered vibration control, consequently *Torflex* Flexible Bearings and Harris Mounts are widely used on prewar equipment, Army and Navy planes, military mobile units of all kinds, industrial equipment, automobiles, electrical and electronic products. If you have a vibration problem, our engineers would welcome an opportunity of working with your engineers, just drop us a line.

HARRIS PRODUCTS COMPANY
CLEVELAND 4, OHIO
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Typical set-up using drill press. Disintegrator "head" is chucked solidly in locked press; work piece is clamped firmly to table. "Head" does not revolve; will operate at any angle.

Drafto Metal Disintegrator

Model 2-A $295 Complete

The Drafto Metal Disintegrator is a compact, portable, self-contained unit designed to save dies and work pieces you formerly scrapped because of embedded tools. It disintegrates metal through the action of a rapidly vibrating electric arc, without excess heat or pressure.

Broken taps are removed by disintegrating the core. You take out broken drills by disintegrating the web. Studs and hardened pins are removed by disintegrating odd shaped holes.

Finished surfaces, hardness of metal, and delicate contours are not affected, for disintegration takes place only where the electrode touches.

Drafto Metal Disintegrator requires no lengthy training period. It comes to you complete, ready to go to work, with its self-contained coolant tank and pump, and a supply of electrodes for $295. Manufactured by Drafto Corporation, Cochranton, Pa. Representatives in key cities.

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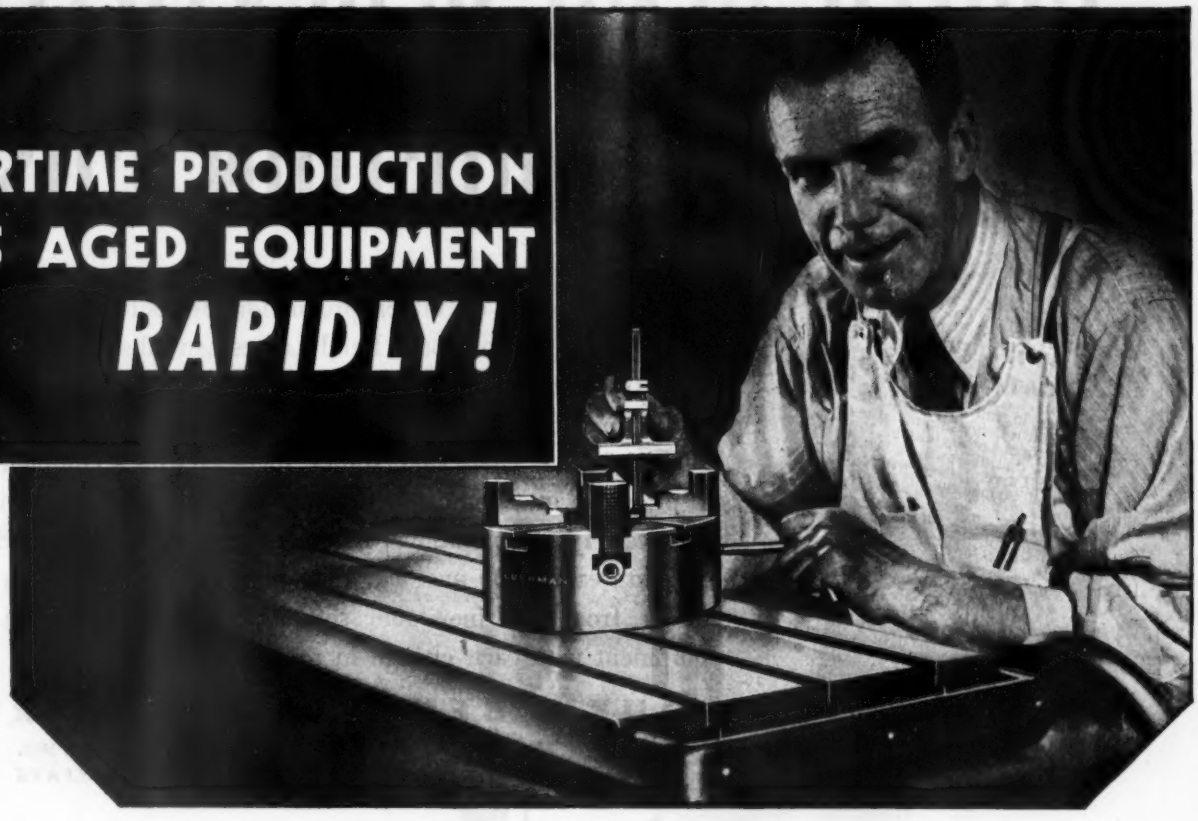
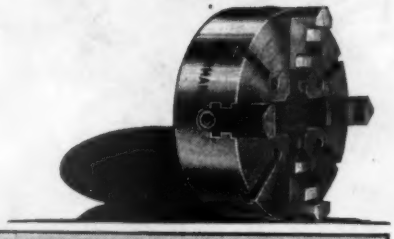


A prominent production executive recently said: "We have kept all our tools in good shape; but because of the work done, they are really 5 or 6 years old when you have had them only 2 or 3 years".

True; heavy production schedules and unskilled operators can put years of wear on a machine tool in mere months. But if your Cushman Chucks have been properly cared for, they should be ready for post-war production loads.

Our "Chuck Check" cards list the six simple rules for correct chuck maintenance and operating practice. They are freely at your disposal for distribution to your operators.

PLAN CONVERSION TOOLING NOW...



As soon as you decide on your peace-time product, consider the work-holding problems involved in machining each part. Out-put per man hour can be increased... and accuracy maintained... by jaw-equipment exactly fitted to each part. Jaw-grip can be placed in correct relation to tool-pressure... and marring of finished work prevented... by correct design of jaws.

In this and many other ways, our engineering department stands ready to help you make your reconversion mechanically successful and financially profitable. Write us on any work-holding problem.

THE CUSHMAN CHUCK CO.
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CUSHMAN CHUCKS

A WORLD STANDARD FOR PRECISION

SOUTH BEND VERSATILITY REDUCES PRODUCTION COSTS

WRITE FOR NEW CATALOG 100-D

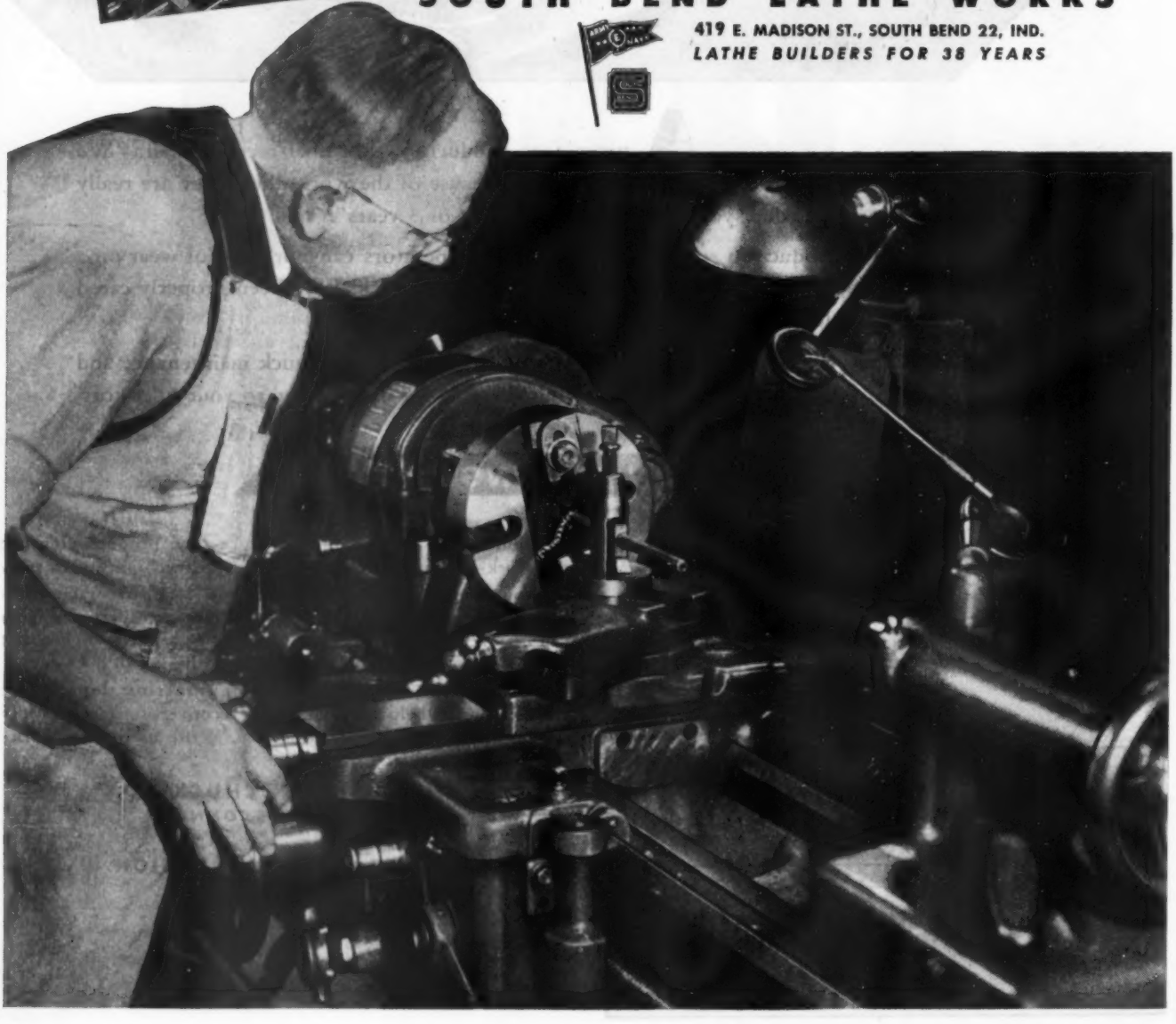
Illustrates in full-color and describes South Bend Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swings. Also, Precision Turret Lathes with ½" and 1" collet capacities.

In reducing costs, on either production or toolroom work, the proven versatility of South Bend Lathes can effect valuable savings. It permits getting new products into production quickly—change over from one job to another with little inconvenience or loss of time. Their adaptability, together with a complete line of practical attachments and accessories, permits handling a wide variety of operations. Often the use of special machines and fixtures can be avoided, thus preventing capital losses resulting from the inevitable scrapping of costly custom-built equipment with each change in product design.

SOUTH BEND LATHE WORKS

419 E. MADISON ST., SOUTH BEND 22, IND.

LATHE BUILDERS FOR 38 YEARS



A few simple rules to conserve carbide tools

FIRTHITE FIELD SERVICE POSTERS are available for display in your plant

The conservation of carbide tools through proper handling and correct usage is essential not only in war time but at any time for best production results and low operating costs.

These Firthite field service posters will help remind your plant operators in simple, easy-to-take, understandable manner, of the right way to make carbide tools do their utmost.

Fill in and mail the coupon for your set of these free, 17" x 22", four-color posters.

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Please send us without obligation on our part_____sets of Firthite Field Service Posters which we wish to display in our plant shops.

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Keep Wheels of Industry Rolling with KEMPSMITH *Standard* ATTACHMENTS

Heavy Duty Universal
Heavy duty angular milling in all planes. (Bulletin No. 104)

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Milling circles or cams, gear cutting, high-speed continuous milling, etc. (Bulletin No. 108)

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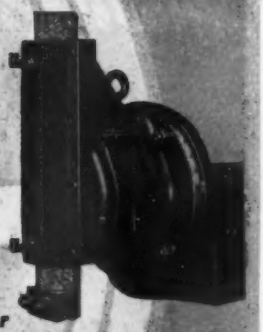
High speed angular milling in all planes. (Bulletin No. 113)

BROADEN THE SCOPE OF YOUR MILLING MACHINES



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A full range for standardized spindles carried in stock. (Bulletin No. 115)

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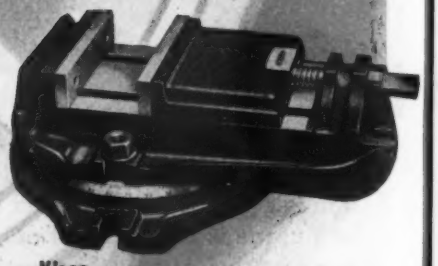

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Standard and Heavy-Duty, plain and swivel types. Adaptable to special jaws to save fixtures. (Bulletin 117)

Convert your general duty milling machine to a special purpose miller by utilizing Kempsmith Standard Attachments.

It's really surprising, the great variety of milling operations that can be handled by Kempsmith *Standard* Attachments mounted on a standard milling machine. The same high degree of rigidity and precision characteristic of Kempsmith Milling Machines for more than 56 years is embodied in these sturdy standard attachments. Thousands are serving industry, every day, performing the most delicate and accurate operations, or handling difficult production milling jobs.

So plan now on broadening the scope of YOUR milling machines by applying Kempsmith Standard Attachments. Write for bulletins designated above.

THE KEMPSMITH MACHINE CO. • Milwaukee 14, Wis., U. S. A.

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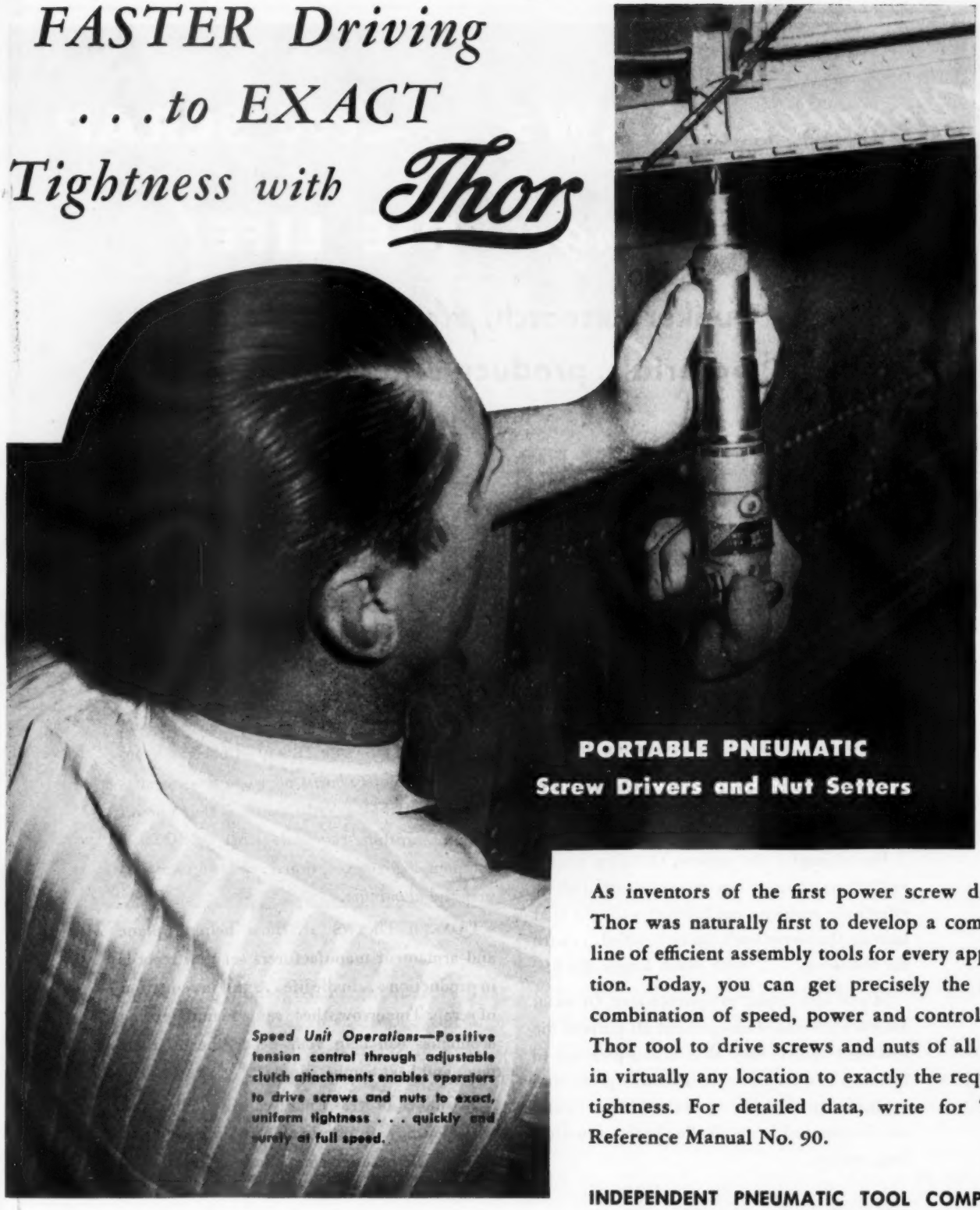
• *Precision Built Milling Machines Since 1888* •

FASTER Driving . . . to EXACT Tightness with Thor



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Screw Drivers and Nut Setters

Speed Unit Operations—Positive tension control through adjustable clutch attachments enables operators to drive screws and nuts to exact, uniform tightness . . . quickly and surely at full speed.

As inventors of the first power screw driver, Thor was naturally first to develop a complete line of efficient assembly tools for every application. Today, you can get precisely the right combination of speed, power and control in a Thor tool to drive screws and nuts of all sizes in virtually any location to exactly the required tightness. For detailed data, write for Thor Reference Manual No. 90.

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Thor **PORTABLE POWER TOOLS**

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UNIVERSAL ELECTRIC
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Heavier DRAWS . . . *Less* SCRAP

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Quaker Research, *plus* new type raw materials, produce *sensational* new

QUAKER DRAWS

IF QUAKER research chemists and engineers had been content to employ only *conventional* types of raw materials in developing drawing compounds, the metal industries would not now be enjoying the superior performance of modern QUAKER DRAWS.

For example, the newest QUAKER DRAW —#140—contains a *new type pigment*. This so effectively cushions and lubricates the die that heavier-than-ever work can be handled . . . with far less scrap . . . with much longer die life.

Mixed with from 2 to 8 parts water, QUAKER DRAW #140 makes an excellent all-purpose die lubricant that is easy to mix and pleasant to handle . . . provides very effective protection against rust when left on drawn parts . . . and can be removed in an alkaline bath, even after long storage.

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QUAKER DRAWS are now helping plane and armament manufacturers set new records in production . . . in die life . . . and in reduction of scrap. Tomorrow, these same manufacturing economies can help your peacetime products meet and beat competition!

A Quaker Process Engineer will gladly work with you now to obtain the maximum advantages which these new compounds make possible!

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Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

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CINCINNATI BICKFORD
THE SUPER SERVICE RADIAL
Cincinnati Bickford special bases are highly profitable—and like the standard bases of web and pillar construction, transmit weight of column, arm, head, and work evenly to foundation.
Equal Efficiency of Every Unit Makes the Balanced Machine

Photo: Courtesy of The American Annealing Box Company, Washington, Pa

The table extension base here, and other types of special bases, permit the simultaneous setting up of jobs without interruption of production. Drilling four plates at once through bushed templates, this Cincinnati Bickford Super Service Radial has effected a 25% saving over previous methods in the shops of The American Annealing Box Company, Washington, Pa.

Write for detailed Bulletin R-24-A.
See our condensed catalog in Sweet's File.

ARMY NAVY

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WORLD'S largest and oldest exclusive manufacturer of precision governing equipment for prime movers, the 75-year-old Woodward Governor Company of Rockford, Ill., has gained worldwide fame for its development and constant improvement of hydraulic turbine governors. They were also the first company to produce satisfactory governors for Diesel engines and variable-pitch airplane propellers.

Like so many metal working plants throughout the nation where *precision is the governing principle,* Woodward has for many years used *Texaco Cutting and Soluble Oils* to assure the faster machining, better finish and longer tool life essential for mass production of precision parts.

Texaco cutting fluids cool and lubricate the tools, carry away heat and prevent chip welding — thus prolonging tool life, assuring greater output.

The services of a Texaco Engineer specializing in cutting coolants are available through more than 2300 Texaco distributing plants in the 48 States. Get in touch with the nearest one, or write:

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RECONVERSION RUSTPROOFING

5 Points to Remember

1. Upon termination of war contracts, Government-owned production equipment must be rustproofed promptly, *in accordance with official instructions.*
2. Ordnance Specification P.S. 300-4 contains *official instructions* for the complete processing of such equipment.
3. These instructions require that only rustproofing materials meeting Government specifications be used.
4. *Texaco rustproofing products meet Ordnance specifications for application on Government-owned equipment.*
5. For full information, see your Texaco representative or write to us.

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TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT—CBS

Small Shops — Postwar

EVERYBODY is the friend of small business—every Senator, every Congressman, every other public official dependent upon election to office.

The Senate has a special committee to study the problems of small business. The House has a similar committee. The Smaller War Plants Corporation is ready to help small business after the war as well as now, if Congress will continue to appropriate the necessary funds.

Provision is made in the Surplus Property Act for preference to be shown small business in offering equipment and materials for sale.

Small business clinics have been held here and there. Henry Wallace's Department of Commerce is solicitous of the health of small business in the years ahead. Still other government departments are worrying over what they should do to befriend the little fellow.

Whether these efforts are motivated by political considerations or by genuine concern over the country's future economy is beside the point. They indicate that the future of small business is a problem that interests a lot of people and is a problem that must be successfully solved if we are to avoid concentration of our industries into the hands of a small number of large corporations.

Let's not underestimate the war jobs done by small business. One of the reasons why subcontracting has worked so well is that thousands of small shops, many of them "war babies," became "subs" and "sub-subs."

Many of these small shops invested a healthy share of their profits in the purchase of equipment badly needed to fulfill their war contract obligations. In too many cases this equipment was obsolete in design, because the shops could get only used tools at the moment. Higher war priorities took all the new machines.

One small Connecticut shop, to be specific, spent $86,898 of its $109,268 of net earnings during 1942-1943 for second-hand machines and other production facilities. Others have done the same.

The result is that too many small shops are going into the postwar period with very little if any capital and a great deal of their profits frozen in "senile" equipment ready for the scrap pile.

With this kind of equipment, these shops cannot hope to compete successfully after the war when low costs and efficient production will be top factors in determining who gets the business.

The least that should be done is to see that these shops are given the opportunity to replace their present worn-out machines with newer tools, perhaps from government surplus stocks, on an easy-purchase basis. Perhaps some concession should be made in prices if the old machines are to be scrapped.

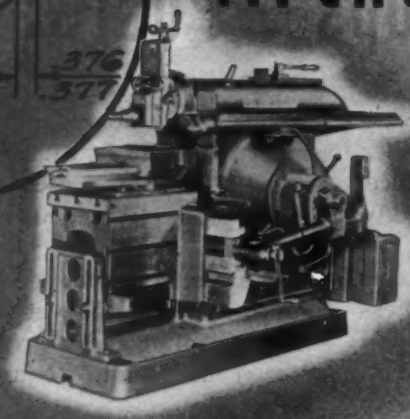
Many small shop owners are extremely jittery about the future. Some have been dependent upon subcontracting for almost all of their work; they are waiting nervously to find out what will happen to subcontracting after our national emergency has ended.

Undoubtedly there will be a place for well-managed small shops that have good equipment and that are alert to the opportunities that confront them. The executives of such shops, incidentally, don't seek favors, don't wish to be coddled and want, above everything else, to stand on their own feet.

For the sake of the nation's future prosperity and general well-being, as many of the small shops as possible should be kept alive and healthy after the war.

Burnham Finney

KEY WAYS ...the right way!



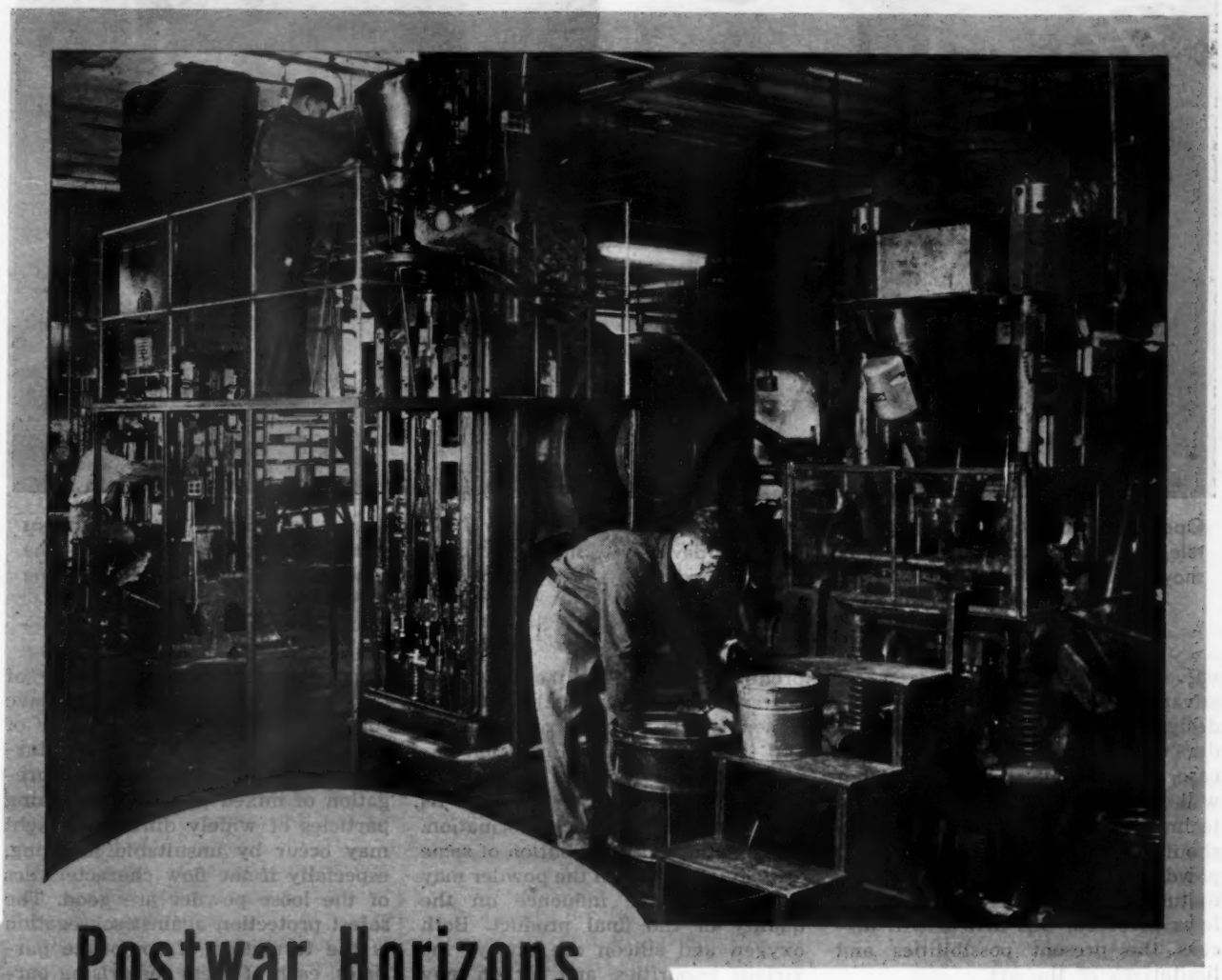
. . . . Internal shaping is another function of the Shaper requiring accurate performance. Here a Cincinnati Shaper holds close tolerances cutting Kennedy Key Ways in an eccentric.

Write for Catalog N-2

THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



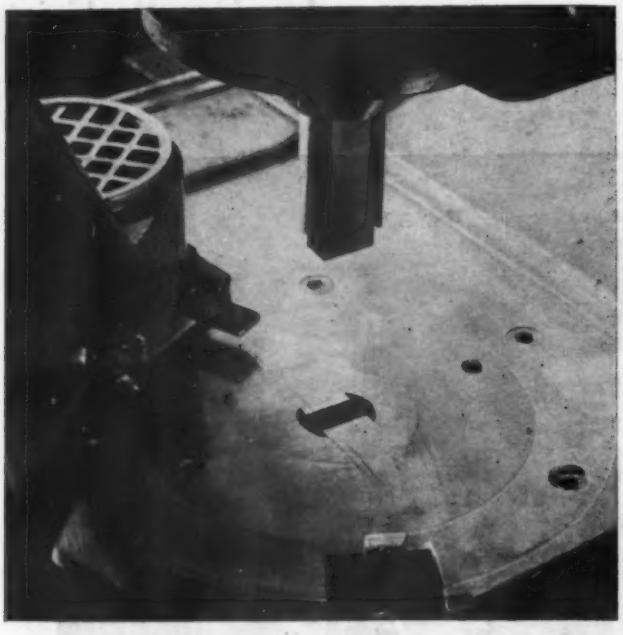
Postwar Horizons FOR POWDER METALS

Presses with special characteristics are required for powder-metallurgical operations. The two machines at right are mechanical presses for compacting powders; the hydraulic press at left has adjustable control over the punch travel for compacting or for coining

BY P. SCHWARZKOPF, DIRECTOR OF RESEARCH, AMERICAN ELECTRO CORPORATION
AND A. REIS, PROFESSOR OF METALLURGY, COOPER UNION

UNTIL RECENTLY, powder metallurgical processes were used exclusively for manufacturing materials and parts requiring unusual characteristics. Examples are ductile refractory metals, cemented carbides, special materials for electrical contacts and porous materials for filters and self-lubricating bearings. In each case, the process is used not for economy but to develop properties unobtainable by conventional methods involving melting. But progress in powder metallurgy during war years has been so rapid that currently the process can compete on a price basis with casting, forging and machining in the manufacture of certain machine parts in ferrous, copper-base and some other alloy materials. And the advantage of special characteristics is not lost.

Manufacturers and engineers considering powder-metal parts for incorporation in their products need much information on the technical and economic considerations in-



Operation sequence for making an iron armature for telephone generators. By means of the filling device shown out of position, the mold is filled flush, and so that the powder charge is of uniform density

Compacting is done in a mechanical press which has stroke, or volume, control. Because of the nature of the iron armature, it is necessary to use more than one punch on both the upper and lower rams

volved. Often it will be necessary or advantageous for them to adapt the design of the part or parts to powder-metallurgy techniques. In each case, selection of the material that will give the best satisfaction on technical and economic grounds should be made in cooperation with powder-metal experts. To promote mutual understanding of the problems involved, this article will discuss the present possibilities and limitations of the art.

Any process in powder metallurgy is based upon a balanced set of operations, normally at least three: (1) production of the powder, (2) compacting, and (3) sintering. The success of the process, judged in terms of specified tolerances and characteristics of the products, requires that each of these inter-related operations be carried out under suitable conditions.

This report concentrates on operating conditions established in commercial production. Other materials and processes, now under study, may enter into production in the near future. For example, sintered steels of any desired carbon content and displaying physical properties comparable with standard engineering materials may soon be available for structural machine parts. Special ferrous compositions for soft magnetic parts have been developed for military uses.

It is beyond the scope of this article to discuss methods of powder production; only some factors of importance for quality will be mentioned. On the primary raw material and the conditions of formation depend the purity and the microstructure of the powder, as well as its behavior under plastic deformation. The amount and distribution of some critical impurities in the powder may have a decisive influence on the quality of the final product. Both oxygen and silicon are always injurious impurities, and carbon may be, depending upon the application. Tolerances depend on the reproducibility of certain powder characteristics, especially purity, apparent density and compactibility. In actual production, fluctuations of these characteristics over a long period often exceed the admissible limits and the producer resorts to blending operations of different powder shipments or to subsequent treatments, mechanical, thermal, or both. Sometimes, such an operation or a refining step is run in the consumer's plant immediately before compacting. Dry soapy lubricants are added by the consumer to facilitate compacting. Metal powders are stored and packed moisture proof; they should be consumed without excessive delay.

Some products are made from one commercially pure metal powder without incorporation of any other element; most products, however, contain an alloy of two or more elements. Often it is preferable to start with the mixed powders of the metallic elements which have softer particles than the powder of the alloy, and to form the alloy during the sintering operation. Segregation of mixed powders containing particles of widely different weight may occur by unsuitable handling, especially if the flow characteristics of the loose powder are good. The safest protection against segregation is the formation of composite particles, each of them comprising particles of different weights.

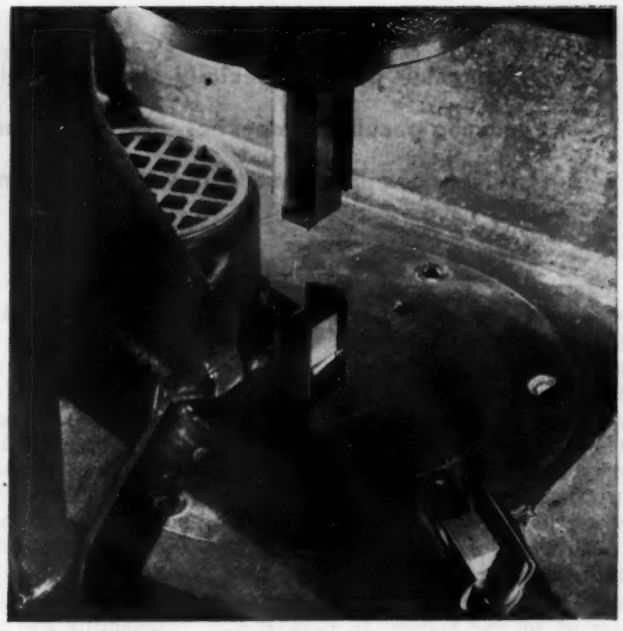
Broad Characteristics

Powder metallurgy processes permit starting with any combination of elements or pre-alloyed powders of various particle shapes and sizes or with particles coated with another metal. This liberty is used in many ways for obtaining products of desired characteristics.

Most applications can be satisfied with the use of pulverized powders containing particles of fine, medium and large size. Mixtures of various particle sizes are desirable in machine parts to obtain satisfactory particle contact. Coarse particles are used when making porous filter materials. A rough shape—spongy, arboric, or dendritic—is better for compaction than a spheroidal particle, provided that the metal is fairly plastic.

Any statement on the aptitude of a particular grain assortment or compactibility factor holds only for

To achieve the desired flow of powder in the mold, the several punches attached to both the upper and lower rams are preset to move independently through specified distances, and thus avoid defective parts



When the briquette is ejected from the mold, an arm attached to the automatic filling device picks up the part and gently transfers it to a slide along which the fragile piece moves to the sintering furnace

a specific case of metallographic constitution and manufacturing process. Generalizations are misleading.

Laboratory methods for testing powder quality are still inadequate for prejudging production results. As a rule, powders are tested by subjecting them to compacting and sintering operations.

The compacting procedure comprises the steps of feeding and filling the standardized quantity of powder into the mold, with suitable provision for compressing, ejecting and lubricating. The choice of processing conditions and equipment depends on the composition and quality of the powder and the shape and size of the product as well as on specifications for tolerances and characteristics.

Automatic filling by volume is the rule. This has been successfully applied for briquetting of an armature for telephone generators. For satisfactory operation it is indispensable to fill the mold flush to uniform density, reducing bridges and local density defects within the powder bed to insignificance.

The difficulty of achieving such degree of uniformity in filling density varies widely with the shape and size of the part and with the flow characteristics of the loose powder, which in turn change with the addition of lubricants (dry soaps which are dissipated by sintering) and may be affected by humidity. In some cases air conditioning has been found helpful. Rapid fill with uniform density is obtained by the selection of a suitable type of powder, by vibrators connected with feeding and filling devices (sometimes with the die) and by special adaptation of the filling procedure to the die design.

Compressing Requirements

Compressing conditions have to be satisfactory for the attainment of the immediate and ultimate goals. The "green" compact made by compression of the powder needs a certain minimum strength for ejection, handling and introduction into the sintering furnace. Special care is required for preservation of any sharp edges and fine configurations without loss of detail. The aim is to have the compact so prepared that sintering will produce the close tolerances and good mechanical characteristics required in the finished part. Achievements of these requirements is to be combined with a short duration of the compacting cycle and long life of die and punches.

The factors involved in compressing are: addition of lubricant; quality of powder and design of part; mode of action of the punches; timing and maximum pressure of the stroke.

Compressing phenomena are determined by the distribution of pressure within the powder and by plastic flow. Pressure builds up in front of the punch, and in the vicinity of mold walls if friction between them and the moving powder is considerable. The ability of the powder to transmit pressure throughout the mold increases with the volume percentage of soft particles. Addition of lubricants improve pressure distribution as well as flow under pressure.

Powders with desirable flow characteristics can be compacted to a high apparent density under moderate pressure and have sufficient lateral flow for releasing shearing stresses and homogenizing the density of the compact, if the compression ratio varies over the cross-section because of its shape.

The difficulty of compacting increases if the dimension of the part in the direction of pressing is large either in actual dimension or in relation to the cross-section. Generally speaking, the height of the compact should not exceed the square root of the cross-sectional area, although in the case of the telephone generator armature, the length is twice the diameter because the material can flow into the connecting bridge. As a rule, an upper and a lower punch advance simultaneously into the die with either pressure control or stroke (advance) control. For briquetting certain shapes, the upper and lower punch may be divided into several independently actuated parts. Other and more elaborate punch movements are under trial right now.

Both the admissible rate of ad-

Small machine parts, especially those difficult to machine or requiring peculiar properties, are being manufactured at costs which compare favorably with better known methods

vance and maximum pressure are limited by their effects on die wear and cohesion of the compact. The latter is endangered by shearing stresses and non-uniform density in the green compact. A rapid stroke may cause failures by stratification within the powder bed starting from local defects of density.

Parts of favorable design have been made from powders with good plastic flow at pressures of 100 tons per sq. in. and higher. In ranges exceeding certain figures, however, cost increases with the pressure, and figures above 50 tons per sq. in. are rare in mass production.

The pressure best suited for obtaining the desired effect during subsequent sintering varies widely with the part design, with the composition and quality of the powder and with the structure, density and strength to be achieved in the sintered product. If the final quality cannot be obtained by a straight sintering without using an excessive compacting pressure, subsequent operations are used. Products with a high degree of final porosity may be compacted at pressures ranging down to 5 tons per sq. in.

Ejection, as a rule, is made by a knock-out stroke of the lower punch. Friction is kept down by providing a taper of 10 min. per side of mold, by adding a lubricant to the powder and by lubricating the mold between compacting cycles.

Split-dies (segment dies) have been used if the design of the part or the properties of the material make it impossible to eject the part from a rigid die, but are now practically obsolete. Elaborate precautions are needed to avoid cracks in compacts caused by non-rigid assemblage of segments.

Presses have been designed for the special needs of powder metallurgy and its different applications. They are built with mechanical or hydraulic drive or both combined, and with any degree of automatic operation.

Dies are made from high chromium or similar alloy steel and hardened. If production runs involve millions of pieces, the mold may be lined with tungsten carbide. Maximum safety and life are secured by combining a hard mold with tough punches. All surfaces in contact with powder are highly polished and lapped in the direction of pressing with special fine rouge. The cost of finishing should be related to the possibility of abrasive scratching the die. If this occurs, wear progresses rapidly. Small clearance between mold and punches is required for compacting soft powders which easily flow into the clearance and for producing sharp-edged parts with perfect edges. In other cases, considerations linked with easy air escape in a rapid stroke may favor increasing the clearance within admissible limits.

Green compacts are fragile, both strength and ductility being extremely low for most materials and pressing conditions. The synthesis of a metallic block from loosely knit particles is accomplished by sintering.

Effective Sintering Achieved

Temperature and atmosphere control are the most important factors for success so far as sintering conditions are concerned. The temperature range for effective sintering is generally higher for the same material than in other heat-treatments and is always above the recrystallization temperature of the metal. This is quite natural as sintering is inherently connected with grain growth phenomena, which are undesirable in most other metallurgical treatments. Within the applicable range of temperatures, which lie between two-thirds and nine-tenths of the absolute melting temperature, the time needed decreases so rapidly with rising temperature that the higher bracket often is preferable for economic reasons. However, the ceiling for sintering temperature is governed by grain growth and furnace temperature.

The suitable composition of the atmosphere varies with the metallic material; in most cases, it will have to be either reducing or neutral but never oxidizing. The oxidizing gases, especially water vapor, must be effectively excluded. Many metals cannot have their oxide films reduced in presence of water vapor even in an atmosphere rich in hydrogen; some are even oxidized under these conditions. Decarburization of steel, slow in dry hydrogen, is stepped up by moisture, if not checked by a balanced addition of carburizing gases. Commercial atmospheres are partially combusted natural gas, producer gas, dissociated ammonia and hydrogen.

Both electric and combustion types of furnaces are in use. Continuous furnaces with conveyor systems adapted to the product, and pusher-type furnaces are superior to batch-furnaces in capacity and heat economy. Charges are moved through the furnace on alloy trays by a hydraulic pusher system. Constant temperature distribution must be maintained in the furnace while the material is carried through the preheating, sintering and cooling zones. Special devices prevent the ingress of air at the furnace doors.

The protective gas in delivered from a separate unit, flows through the furnace and is partly re-utilized in some installations. Suitable composition is assured by automatic control.

The change in compact dimensions is the most obvious sintering effect, but of minor importance compared to the gain in cohesion. For the same material processed under different conditions, however, strength and ductility increase, as a rule, with the apparent density of the sintered compact.

Control Dimensional Change

Powder-metal compacts may grow or shrink during sintering, depending upon temperature and composition. Non-ferrous metals, especially brass, tend to grow, whereas steel shrinks. Usually the change in either case amounts to only a few thousandths of an inch per inch. As a rule, a high compacting pressure, low sintering temperature and a short cycle encourage growth, but low compacting pressure with either high temperature or a long cycle promote shrinkage. However, it is possible to balance conditions so that practically no dimensional change occurs.

Close tolerances require reproducible changes in dimensions during sintering, and these in turn make it necessary to keep constant all the conditions affecting sintering phenomena, including the maximum temperature, the time at different temperatures (heating rate as well as duration of sintering and maxi-

mum temperature) and composition of atmosphere. Since in many cases, fluctuation of shrinkage amounts to a fairly constant fraction of shrinkage, it is easier to achieve close tolerances if shrinkage itself is small.

Satisfactory sintering effects are achieved at lower temperatures with mixed powders of different composition than with powder of a homogenous alloy, if one of the components melts at or below sintering temperature.

Sintering sometimes is followed by coining or sizing. This operation is calculated to obtain closer tolerances or increased density, ductility and strength. Coined parts may be soft-annealed at normal annealing temperatures in a suitable atmosphere, or they may be annealed as part of a heat-treating cycle, quenched and tempered.

Impregnation of self-lubricating parts with oil is done immediately after sintering. After sizing, re-oiling may be required.

In a cycle comprising a coining operation, compacting can be carried out at a lower pressure than is otherwise required. The resulting advantages in capacity and die life may mean the difference between success and failure in the economic competition between powder metallurgy and other processing methods.

Increasing Material Density

Another procedure aimed at increasing the density of the material is impregnation of the compact with a low melting alloy or lead. The same method is applied to impregnating tungsten with copper to make heavy-duty contact metals. This may take place during or after sintering. The composition of the molten addition is selected with a view to the use of the product, especially the desired friction or anti-friction effect. Little has been revealed about these important questions.

Subsequent surface treatments such as electroplating may require special preparation for avoiding failures due to porosity. These treatments include wax impregnation, shot blasting or coining.

Instead of being compressed in a die, metal powders may be cold compacted by other processing operations, among which rolling between steel sheets seems to be an interesting procedure. Facings for clutch plates have been so made.

Hot pressing processes, using preforms heated in the mold, have been developed with remarkable technical success, but their application in mass production seems to have been limited to cemented carbides up to now. According to the temperature used, hot pressing may be the equivalent of cold pressing plus sintering or it may only secure a full pressing effect at low pressure and may require subsequent sintering. The process is not as rapid as compacting and sintering except with multiple-cavity molds of simple design, and hence is warranted chiefly for making products with "super qualities" when the product price permits.

Sintering of non-compacted powders can be of interest, especially where materials melting partially are used and where problems of protection against oxidation can be dealt with easily.

A second instalment on tool design and product design will be published in an early number.

Sintering furnaces of the conveyor or pusher type are best for large volume operation. Since gaseous atmospheres of several types may be required, it is good practice to pipe them from separate units

Air-Hydraulic Milling Vise Permits Controlled Clamping Pressure

BY CONRAD MATTSON, BOEING AIRCRAFT COMPANY

Four castings are used in the vise developed for high-speed carbide milling of steel and aluminum alloy parts. The jaw openings are regulated easily

UNIFORM, controllable clamping pressure is a feature of a heavy duty air-hydraulic milling vise developed by the Seattle Division of the Boeing Aircraft Company for high-speed carbide milling of steel and aluminum alloy parts for Boeing B-29 Superfortress bombers. The two hardened steel vise jaw inserts are interchangeable with jaw inserts made for standard No. 5 Cincinnati milling machine vises. Special jaw inserts can be used to hold parts of irregular shape.

Tests have shown that with a 95-lb. per sq. in. shop air line pressure, a jaw pressure of 23,000 lb. is developed with this vise. By inserting a standard pressure regulator in the air line connected to the vise, jaw pressure easily can be set to any desired value.

Although more expensive to install than a standard milling machine vise, this unit has a number of advantages. Among them can be listed:

1—Maximum clamping pressure is obtained without it being necessary for the operator to hammer on the vise lever with a mallet, as is done in most shops equipped with standard milling machine vises.

2—When the desired clamping pressure is determined, and the pressure regulator is properly set, the part is clamped with the same pressure each time, even though there may be some dimensional variations in the parts. Full pressure is developed whether the piston of the air cylinder makes a full or a partial stroke.

3—The heaviest parts can be clamped as easily by a woman operator as by a man, since all that is necessary to operate the vise is a simple one-hand movement of the control lever on the air valve.

4—While the maximum opening of the vise jaws is 7 in., the maximum clamping stroke is only ½ in. and time is saved by not opening the jaws the full distance each time. It is a simple matter to adjust the jaw opening with the handle on the end of the adjustment shaft.

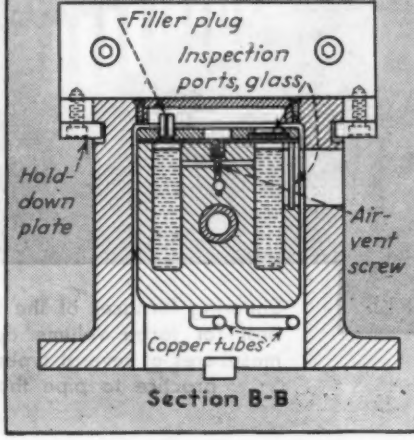
Four Grade B Meehanite castings are used in this vise. These include the vise body, the movable jaw, the cap covering the opening above the jaw operating lever and a bearing cap casting. Each casting is normalized before machining. The two steel vise jaw inserts are made from SAE-3140 steel, heat-treated to a hardness of 40-45 Rockwell C, and ground all over. They are 8½ in. wide, 2½ in. high and 47/64 in. thick.

Clamping pressure on the movable jaw is applied by admitting air under pressure into the left-hand end of the air cylinder built into the body of the vise. Movement of the piston in this cylinder to the right forces the piston rod into the smaller of two hydraulic cylinders. Oil forced out of this cylinder enters the larger right-hand hydraulic cylinder, forcing the piston to the right against spring pressure. This, in turn, applies pressure against the lower end of a 1-to-1 ratio lever, the upper end of which bears against a pressure collar on the end of the adjustment screw in the movable jaw of the vise. Quick return of the jaw is obtained by applying air to the other side of the piston in the air cylinder, thus relieving hydraulic pressure on the larger piston and permitting the spring to move the piston to the left and so operate the lever to move the vise jaw to the right.

Maximum stroke of the piston in the air cylinder is 4½ in. This cylinder is lined with a 5⅜-in. diameter and 6 11/16-in. long naval brass sleeve having a bore diameter of 5.000 in., plus or minus 0.001 in., which is ground and polished to eliminate friction and wear on the two "Vim" leather cup packing elements in the piston head. The right-hand end of the piston rod for the air cylinder serves as the piston for the first hydraulic cylinder. This rod is made of SAE-3140 steel hardened to 35-40 Rockwell C and ground and polished all over to a diameter of 0.6245 in., plus or minus 0.0002 in. The outer end is grooved for two Neoprene synthetic rubber ring-type packing glands.

The mild steel hydraulic unit housing is assembled to the vise body casting with four ⅜ in. socket head cap screws. In the housing is

Designed by Boeing tool engineers for use on milling machines when carbide milling steel or aluminum alloy parts, this 10-ton capacity air-hydraulic vise is operated by simple movement of an air control valve. The clamping pressure is the same each time, not variable as with a lever-operated vise when the amount of pressure depends upon how hard the handle is hammered with a mallet. Special jaws can be used to hold irregular shapes



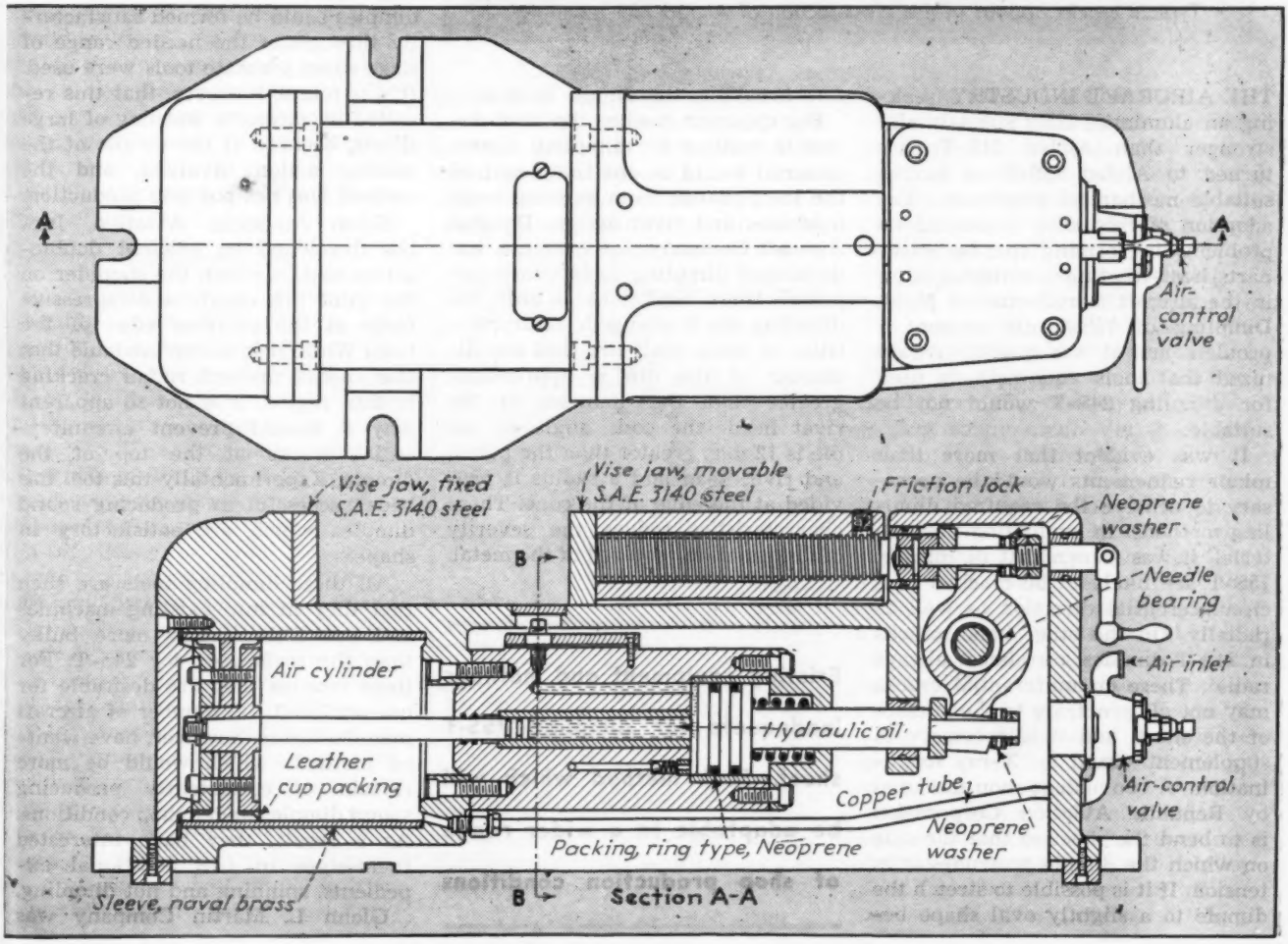
a steel sleeve hardened to 63-65 Rockwell C. This sleeve is 5⅜ in. long and has a 0.6250 in. bore which is lapped and polished plus or minus 0.0002 in. The right-hand hydraulic cylinder is lined with a steel sleeve hardened to 63 Rockwell C. It is 2⅞-in. outside diameter and 2¼-in. long. Bore of this cylinder liner is 2.5000 in., plus or minus 0.0002 in.

The piston for the right-hand hydraulic cylinder is made of SAE-3140 steel, hardened to 35-40 Rockwell C and ground all over. The head and the rod are integral, and the head is grooved for two Neoprene synthetic rubber packing rings. The 1⅛-in. diameter piston rod is guided in a hardened steel bushing supported in a section of the main vise body casting. On the ½ in. diameter extension of the piston rod is a steel pressure collar hardened to 63-65 Rockwell C. This collar bears against the lower end of the operating lever which is hardened to 40-45 Rockwell C and ground on the radiused contact ends. The lever is carried on a Torrington No. AT-16 needle bearing assembly. On the outer end of the hydraulic piston rod is a cushion washer assembled by sandwiching a 3/16 in. thick washer of Neoprene between two standard ½ in. steel washers.

Above the hydraulic cylinder is assembled the movable jaw operating mechanism, which consists of a large adjustment screw, to which is pinned an adjustment shaft. On the outer end of this shaft is a handle for turning the screw to adjust the jaw opening. The adjustment screw is made from SAE-3140 steel, hardened to 35-40 Rockwell C. The outer end of this screw is supported by a hardened steel guide bushing like the one used below to support the outer end of the hydraulic piston rod. The adjustment shaft carries a pressure collar and a Neoprene "sandwich" washer like those used on the piston of the hydraulic cylinder below. This shaft is also made of SAE-3140 steel hardened to 30-35 Rockwell C. The outer end bears in a hardened steel guide bushing like the others described. These guide bushings are hardened to 63-65 Rockwell C, are ground all over, and are keyed to the body casting with two dowel pins.

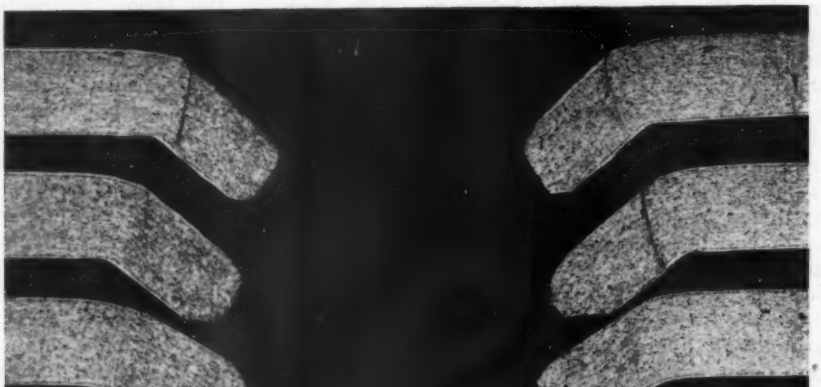
The hydraulic unit housing is machined to provide two large cavities which are connected at the top and at the bottom with cross-drilled holes. These cavities serve as a reservoir for the hydraulic fluid. The bottom cross-hole is connected to the larger of the two hydraulic cylinders by means of a ball check valve held in place with a setscrew that is drilled lengthwise for a ⅛-in. diameter passage. This valve permits filling the cylinder from the reservoir cavities, but will not permit flow of oil into the cavities when the fluid in the cylinder is under pressure. The upper cross hole connects the larger hydraulic cylinder and the two reservoirs to an air vent screw used when bleeding air from the hydraulic circuit. Two double-strength glass inspection ports are provided so that the oil lever in the vise can be inspected regularly.

It is necessary to bleed the hydraulic system periodically to insure that no air is in the pressure cylinders when the vise is in operation, and it is essential that the hydraulic system be bled before using the vise if it is turned over. A coverplate between the vise jaws and the filler plug are removed to bleed and fill the hydraulic system.



Standard Dimpling Methods Adapted For 75S-T Aluminum Sheet

BY KIRBY F. THORNTON, AIRCRAFT DEVELOPMENT ENGINEER, ALUMINUM COMPANY OF AMERICA



Typical cracks appear in this cross-section of Alclad 75S-T dimples

THE AIRCRAFT INDUSTRY, seeking an aluminum alloy substantially stronger than Alclad 24S-T, has turned to Alclad 75S-T as having suitable mechanical properties. The adoption of this alloy presented no problems in forming the necessary parts, heat-treating or artificial aging in the aircraft manufacturer's plant. Dimpling of 75S-T did present a problem and it was quickly recognized that tools and methods used for dimpling 24S-T would not be suitable.

It was evident that more than minor refinements would be necessary to achieve the required dimpling methods. In evaluating the material, it was shown that dimples in 75S-T are likely to be cracked in a circumferential direction as well as radially. On the other hand, cracks in 24S-T dimples are almost always radial. These circumferential cracks may not all penetrate to the surface of the sheet, and it is necessary to supplement visual by X-ray examination. A convenient shop test used by Republic Aviation Corporation is to bend the sheet so that the side on which the dimple protrudes is in tension. If it is possible to stretch the dimple to a slightly oval shape before breaking, the dimple is good.

For apparent reasons the most desirable method for dimpling a new material would be one that required the least change from existing tools, machines and rivet design. Douglas Aircraft Company, for example, has developed dimpling tools which approach these conditions as only the dimpling die is changed. Characteristics of these tools are that the diameter of the die is appreciably greater than the diameter of the rivet head; the cone angle of the die is 12 deg. greater than the punch and rivet head and a radius is provided at the edge of the cone. These characteristics reduce the severity of deformation required of the metal.

Existing equipment and methods inadequate for dimpling 75S-T sheet. Seek method which will be adaptable to a wider range of shop production conditions

However, these tools must be made and maintained more precisely than is a common practice for 24S-T dimpling tools.

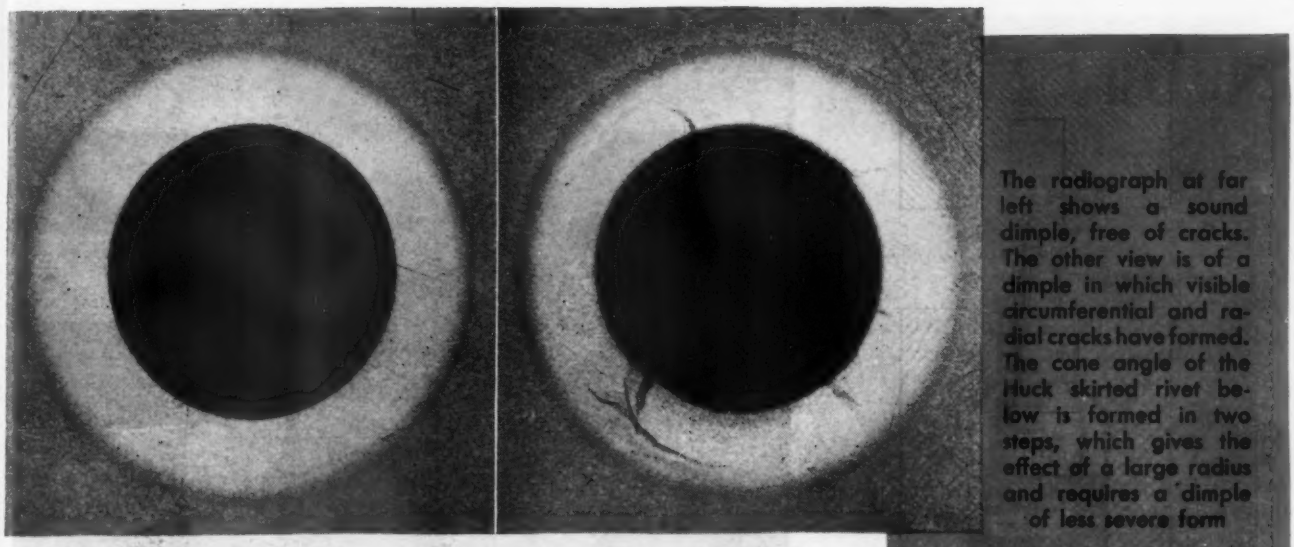
Another approach to the problem is to abandon the standard 100-deg. rivet in favor of one which requires a less severe dimple. While not desirable from the standpoint of standardization this has provided a satisfactory procedure for the Edo Aircraft Corporation. Huck skirted rivets are used and the cone angle is formed in two steps, which has somewhat the same effect as a large radius.

One manufacturer has made a thorough study of the use of 115-deg. rivets and found that individual dimples could be formed satisfactorily throughout the needed range of sizes when accurate tools were used. It was found, however, that this resulted in excessive warping of large sheets, because of the details of the coining action involved, and the method was not put into production.

North American Aviation, Inc., has developed an efficient double-action tool in which the shoulder on the pilot pin exerts a compressive force at the extreme edge of the hole. While it is understandable that this should prevent radial cracking in that region, it is not so apparent why it should prevent circumferential cracks at the top of the dimple. Experimentally this tool has been successful in producing sound dimples which are satisfactory in shape.

All these dimpling tools are such that they fit into existing machines and are little if any more bulky than the tools used for 24S-T. For these reasons they are desirable for use on 75S-T. A number of aircraft manufacturers, however, have wanted methods which would be more certain of consistently producing sound dimples under shop conditions. As a result, they have interested themselves in two additional expedients, spinning and hot dimpling.

Glenn L. Martin Company was



The radiograph at far left shows a sound dimple, free of cracks. The other view is of a dimple in which visible circumferential and radial cracks have formed. The cone angle of the Huck skirted rivet below is formed in two steps, which gives the effect of a large radius and requires a dimple of less severe form

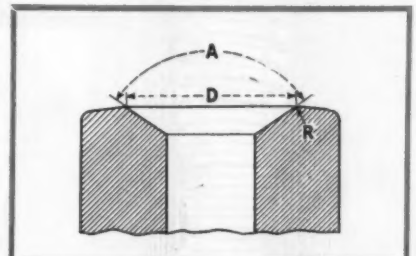
working on spin dimpling tools for magnesium when 75S-T became available. It was found that the method was well suited to this alloy and it is now being used. Advantages of this method are complete freedom from cracking and well formed dimples that result in a flush job of riveting.

Although part of the cladding is lost from the inner conical surface of the dimple some still remains and provides better protection than machine countersinks. The principal disadvantage of spin dimpling is that drill presses are required, instead of the conventional squeezers. The speed of dimpling is somewhat reduced, particularly in the heavier gages. Alclad 75S-T up to at least 0.064 in. thick can be dimpled by this method.

Dimpling Considerations

In analyzing hot dimpling, consideration must be given to the question of possible damage to the material, as well as to the problems of how to apply and control the heat and the detailed design of the tools. Since 75S-T is artificially aged at either 250 to 315 F. as a final heat-treatment prior to use, it seems reasonable that the momentary application of these, or even somewhat higher temperatures, would not produce any further noticeable effects. This has been substantiated by mechanical property tests and accelerated corrosion tests. It seems certain that the controlled use of heat in forming dimples is not harmful to 75S-T, where only a reasonable working margin of time or temperature is provided.

When the dimples were made in a single-action mechanical press having a crank speed of 30 r.p.m. the time was constant and of short duration. With the tools at a temperature of 440 F. circumferential cracks resulted, while at 520 and 640 F. sound dimples were made. To complete this work and find a suitable operating temperature for this speed, it is assumed that additional tests should be made in the range between 440 and 520 F. to determine more precisely what minimum tool temperature prevents cracks. An operating tool temperature about 50 deg. hotter would be used in order to provide a margin of safety to compensate for variations in material, as well as in shop conditions.

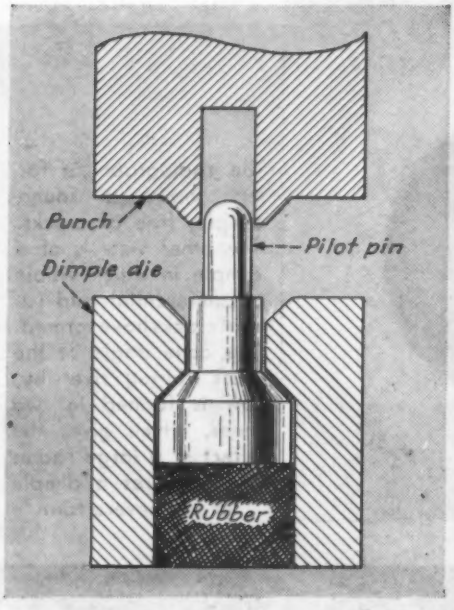


Rivet Size	D	A	R	Maximum Sheet Gage
AN-426-4	0.253	112°	0.009	0.040
AN-426-5	0.318	112°	0.015	0.051
AN-426-6	0.387	112°	0.040	0.064

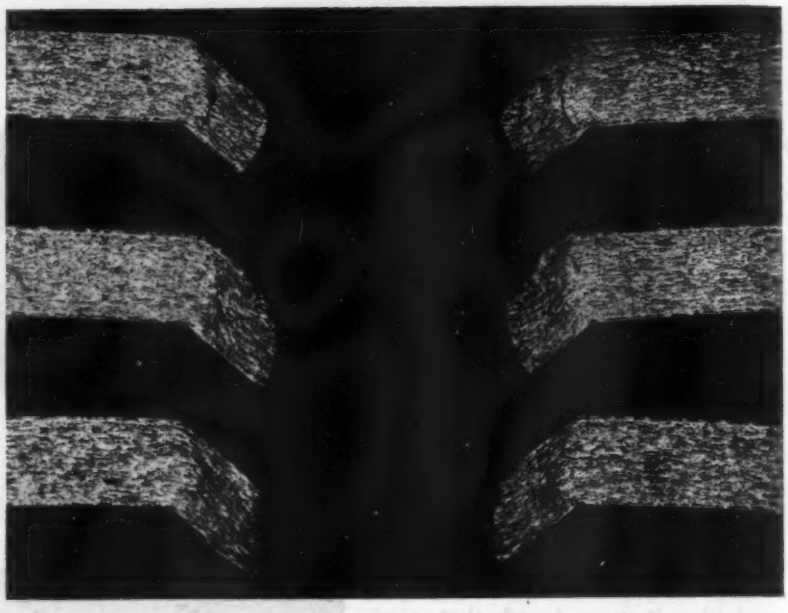
Severity of metal deformation is reduced by the characteristics of this dimpling die, used by Douglas Aircraft Company, Inc., for 1/8, 5/32, and 3/16-in. A. N. - 426 rivets

It has been suggested that the pneumatic type of dimpling machine would lend itself to controlled timing. By bringing the heated tools into firm contact with the sheet and holding them there for a fraction of a second before completing the stroke, the time allowed for heat transfer from the tools to the metal might be doubled or even trebled. This would result in a small increase in the over-all time required to make a dimple but it would permit operating the tools at a lower and safer temperature. Machines using heated tools should be set-up so they will not remain closed, even though the operator keeps his foot on the control pedal.

Several heating methods have been used experimentlly and at least one of them is now being used in pilot plant production. One of these methods involves passing a heavy



The shoulder on the pilot pin of this double-action dimpling tool exerts a compressive force at the very edge of the hole, and prevents radial cracking

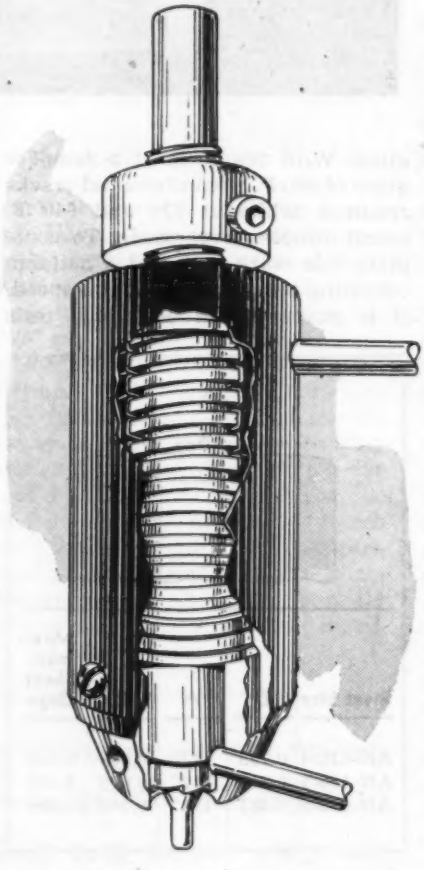


The sound dimples were made in a single-action mechanical press with a crank speed of 30 r.p.m. and tool temperatures of 520 and 640 F. With the tool temperature at 440 F. cracks appeared in the dimples shown at the top

electrical current through the metal, using the dimpling tools as electrodes. The time required to heat the spot to be dimpled is small in comparison with the normal time required to index the material from one hole to the next. The result of this is that the over-all speed is practically the same as it would be for an ordinary squeeze dimpling operation. The flushness and nesting quality of the dimples can be excellent if tools of proper contour are used. Mechanical soundness depends, of course, on the use of the proper heating cycle for the gage of sheet and the size of rivet being applied. Curtiss-Wright Corporation and Northrop Aircraft, Inc., have joined together in developing this heating method.

Heated Tools Impractical

Aluminum Research Laboratories has used the electrical resistance heated tool method in evaluating the effect of hot dimpling 75S-T. The heaters, however, were bulky and would not have fitted into an ordinary dimpling machine. Edo Aircraft and North American have experimented with electric resistance heated tools which were compact enough to fit standard equipment. The commercial requirement at this time is for really compact electrically heated tools for this purpose. Such tools would need individual automatic controls to maintain temperature within 25 F. of nominal over a wide range of operating speed and differences in material thickness.



The cutters on this spin dimpling tool are for removing the burr around the edges of the hole. Freedom from cracking and well formed dimples are provided with this type of tool

One of the primary advantages of hot dimpling is that the geometry of the dimple can be established without making compromises, dictated by the workability of the material. Time can also be saved by the elimination of deburring and chamfering the holes. One result of the lack of portability of both the spinning method and the hot method is that it puts a premium on assembly procedures which permit dimpling at the bench rather than in the jigs. Although troublesome in the beginning, this may turn out to be an advantage.

While all these variations in dimpling technique have been undergoing development, Alcoa has attacked the problem from the standpoint of improving the dimpling characteristics of the material itself. It is normal for the metallurgical quality of a new material to improve gradually as manufacturing experience accumulates. This has been the case with 75S-T.

In addition to the normal and gradual development, Alcoa has recently started to use a new interrupted aging treatment. This involves heating for 4 hr. at 210 F., cooling to room temperature and heating 8 hr. at 315 F., and improves the dimpling characteristics appreciably. It is believed that this improvement will be enough to make dimpling methods satisfactory for shop production operations.

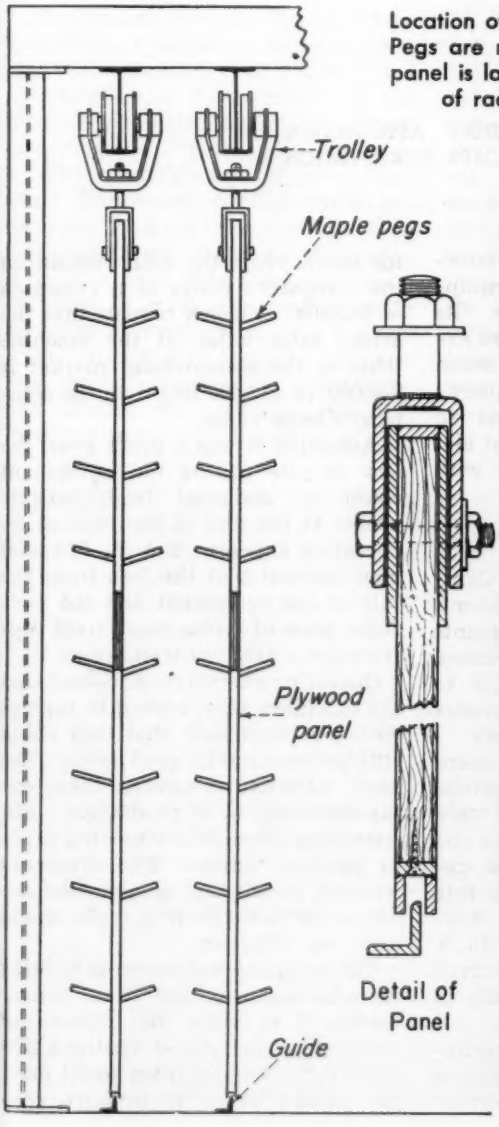
Fabricated Storage Rack Protects Cutters

MORE THAN 4,000 milling cutters can be stored safely and accessibly on custom-built movable racks which occupy about 102 sq. ft. of floorspace. Although units of any size can be constructed, North American Aviation is now using two units of eight panels each, providing storage for this number of cutters. When combined with a card index system, cutters of all sizes and shapes are recorded and located with a minimum of effort.

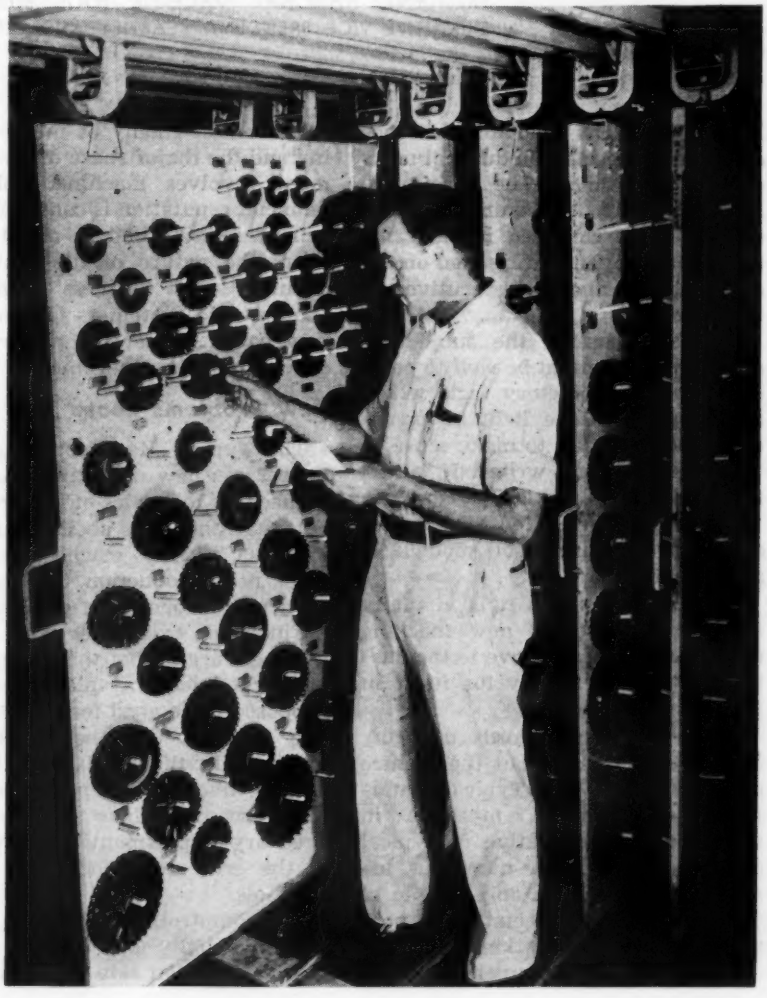
The individual storage panels consist of ¾-in., 5-ply plywood sections which are 4 ft. wide and 7 ft. high. These panels are braced on three sides with iron straps and on the top with a ¼-in. iron strap. Louden trolley hangers, bolted to this latter strap, carry the panels on heavy-duty I-track. This load-carrying superstructure is fabricated by welding. Angle iron, bolted to the floor beneath each panel, serves as a guide. Panels may be pulled forward 4 ft. so that the entire face is fully exposed. Stops prevent the heavily-loaded panels from being rolled out too far.

Milling cutters are hung on ½-in. maple pegs which are glued into the plywood panel at a slight upward angle. Pegs are used on both sides of the panel and are consequently staggered in distribution. Spacing of the pegs can be varied to handle the required sizes of cutters. A small wooden marker is placed below the cutter edges to indicate the size. At the end of each marker is a small brass cup hook to identify the operator receiving the cutters. Should extra protection be required cardboard may be used between cutters.

Each panel is numbered on the front edge. The right-hand side carries the letter *A* and the left-hand side the letter *B*. In applying a location code a card marked 6-*A*-4-2, for instance, would indicate that the cutter is stored on panel No. 6, right-hand side, on the fourth row of pegs from the top and two rows in from the front edge of the panel. Metal handles are attached to the front of each panel for easy withdrawal.



Location of cutters is simplified by means of markers and a card index system. Pegs are numbered down from the top, and in from the outside edge. Each panel is labeled according to the type of cutters it carries. Simple construction of rack is indicated by front elevation of a typical panel, at the left



The need for a common language between financial executives and operating men in the matter of machine tool obsolescence is emphasized by the author. Adherence to original schedules of depreciation regardless of a machine tool's inability to produce at a profit is cited as a disastrous company policy

DEPRECIATION—
Graveyard of Dividends

BY JOSEPH L. TRECKER
PRESIDENT, NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
EXECUTIVE VICE PRESIDENT, KEARNEY AND TRECKER CORPORATION

DEPRECIATION and obsolescence are familiar terms to industrial users of machine tools. The terms are latitudes apart in meaning but they often become confused in their interpretation by operating men on the one hand and financial executives on the other.

Before discussing the subject of depreciation it might be well to point out three contradictory facts which are true but in the light of everyday experience fail to make sense:

1. The average write-off period for machine tools is 20.74 years.

2. The average period for obsolescence of machine tool models is about seven years.

3. In normal times it is virtually impossible to sell a new machine tool unless you can prove to the customer that it will pay for itself in less than three years.

The experience records of many companies will bear out the picture of depreciation. The Typical Manufacturing Company, mythical in name but representative of typical company practice in numerous instances, is offered as an example of the problem of depreciation in normal, peacetime operations.

Fair in size, the company's operations consist chiefly of metal-working and the major share of its equipment involves machine tools. Its financial reputation is considered excellent. At the end of about seven years the nature of the company's clientele and business begins to change. Old customers fade out and new patrons enter the picture with different work requirements.

New Problems Loom

The Typical Manufacturing Company faces new operating problems. A machine tool sales engineer points out that the firm should purchase $100,000 in new machine tools to meet new production requirements on a proper operating cost basis.

Financial executives and board members argue that the old machine tools scheduled for replacement were supposed to be good for 20 years and cite the fact they have been depreciated by the company at the rate of only five percent per year. Furthermore, they show that the U. S. Treasury Department has concurred in the estimated productive life of the tools.

The comptroller reveals the equipment originally cost $80,000, and at the depreciation rate of five percent for seven years the tools remain on the company's books at a valuation of $52,000. A check reveals that the actual sales value of the machine tools in the second-hand market is $20,000, or $32,000 less than the company's book value.

Assuming it was a profit year, the loss in sale of the old equipment could be deducted from taxable profits at the end of the year as an operating expense. But the financial men insisted that the loss from the sale of old equipment and the purchase price of replacement tools represented a $132,000 transaction.

Operating executives admitted that the machines they wished to replace were not worn out; that they could still do reasonably good work. The only question involved, they explained, was one of production costs, stemming from improvements made in machine design. The argument was not convincing enough and the operating department's replacement plan was scrapped.

The company succeeded in holding its new business, but it no longer contrived to make the margin of profit of former years. Within a few short years the declining profit margin picture began to threaten con-

tinuity of the company's regularly established dividend payments. But meanwhile, at the rate of five percent a year, the company had accumulated depreciation reserves. This money, however, became the basis of paying dividends which could no longer be met out of current earnings.

A year or two later, the nature of the firm's customers and business again changed. By this time the machine tool equipment was 13 years old. Obviously new machine tools were necessary, but depreciation reserves had been dissipated by dividend payments. The company's financial condition was impaired. Efforts were made to borrow money, but the investigations of prospective lenders revealed the company's equipment was old and too risky to justify a loan.

At this precarious point, the company had to either stop paying dividends and raise capital to get its equipment modernized, or wind up in bankruptcy court.

A summation of the Typical Manufacturing Company's position bears out the contention that a lack of understanding of the principle of depreciation creates one of the largest graveyards for dividends.

Why does this sort of thing happen? The writer attributes it to the premise that too many people in a company speak different languages. The financial men are generally anxious to make the best possible showing of earnings for the *current* year. That's only human. The less the annual depreciation allowance, the greater the earnings. Internal revenue collectors agree with this theory because the smaller the depreciation allowance, the larger the taxes that pour into the Government's coffers. These men do not understand the technical side of factory operations.

The company's operating men, on the other hand, don't know much about taxes, and are not directly concerned with dividends. They talk in terms of wage rates and output per man per hour. They can present to the financial executives a picture of cost reduction, but the latter fail to understand it. The operating men do not talk to the internal revenue collectors, so the latter receive their information in the language of the financial men.

The underlying reason for this confusion in language might be summed up as follows:

Operating men think more in terms of obsolescence than in terms of depreciation. Obsolescence is an operating reality—depreciation is an accounting procedure.

Differences In Thinking

Financial men think in terms of depreciation rather than obsolescence. They don't know whether a particular machine is obsolete, but they do know the annual recovery rate of the purchase price of that machine. And they consider this factor not in terms of performance of the machine, but in terms of the over-all current financial picture of the company.

The internal revenue men do not know metal-working operations, so they base their depreciation schedule rulings on the continuing use of the machine. The shop superintendent can shout that the machine is obsolete, but if it is still functioning, the internal revenue agent reasons that it is still capable of returning a production profit.

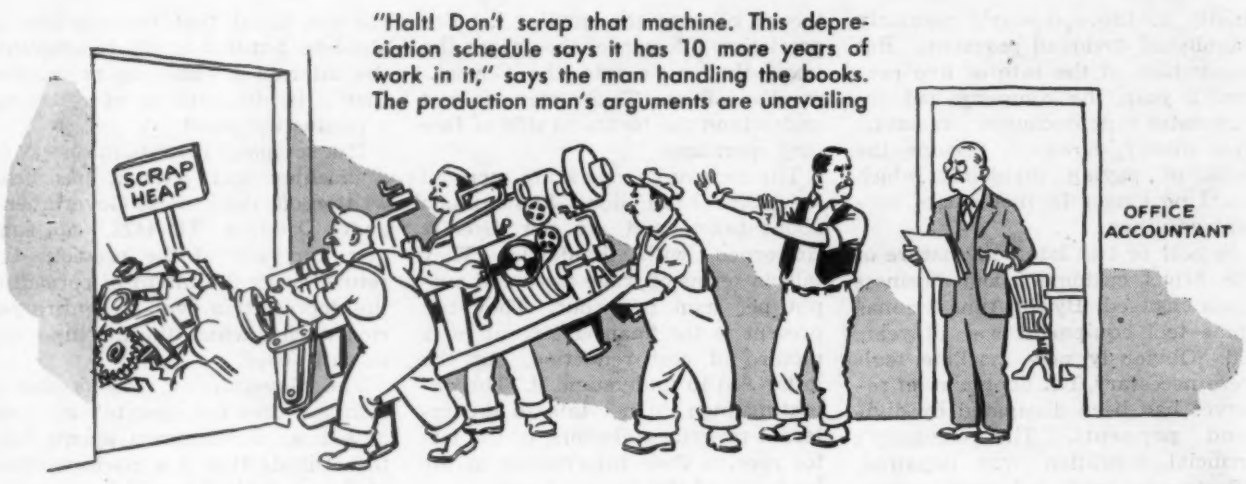
If a company persists in operating a machine tool after it has been written off, the Federal Government, under Decision "TD-4422," can suggest a review of the previous tax returns with the intent of spreading the depreciation over the entire period during which the machine was actually used.

The Government reasons that a company does not operate a machine at a loss. Government agents take the attitude that if a machine operated as a debit it would be scrapped and replaced. They are not interested in the "inner thinking" of a company as qualification of the reason for the machine's continued use.

That is right where the Government puts its finger upon a major weakness in the management of American industry. It is true that the financial side of industrial management refuses to accept obsolescence as an actual fact. Thus operating departments are compelled to function with machines which, by comparison with new models, show operating losses instead of profits. A machine does not have to be worn out to show an operating loss.

The Government contends that a machine tool should be depreciated over the extent of its useful life. But is a machine tool still useful when it is operated beyond its capacity to produce at a profit? If a machine tool can still function well as a mechanism but cannot maintain its proper ratio of operating earnings,

The board chairman who refuses to open the purse strings when it comes to replacing obsolete equipment is being "penny wise and pound foolish." Modern equipment often pays off in greater dividends



"Halt! Don't scrap that machine. This depreciation schedule says it has 10 more years of work in it," says the man handling the books. The production man's arguments are unavailing

the question of its usefulness is hardly a matter for debate.

If a company decides upon buying a new machine tool to depreciate it over a 10-year period, it is generally wise to replace it at the end of that period. This action proves to the satisfaction of the Government that the firm's original depreciation schedule was correct.

Factors on Depreciation

There can be no rule-of-thumb answer to the question of a machine tool's life in years. The machine and the work it performs are the factors determining its depreciation. It is unwise to take a whole plant full of machine tools and put them on a uniform depreciation basis. Some wear out sooner than others because of their nature or the extent of their operation. But more important, some may become obsolete far earlier than others.

Suppose the aforementioned Typical Manufacturing Company had looked at the depreciation situation realistically. If at the time of its original reequipment the company had set up depreciation schedules on a 10-year rather than a 20-year basis, and the books were set up to cover individual machines substantial benefits would have resulted and the company's financial position would have been secured.

At the end of seven years when the question of machine tool replacement arose, the company could have reviewed its entire depreciation picture; extended depreciation on some machines, the operation of which still appeared practical. These adjustments could have been made to the satisfaction of the Treasury Department and then the firm would have been in a position to buy the $100,000 worth of new machine tools which had been recommended.

The probability is that if the new tools were put on the average of an eight-year depreciation schedule, they would have paved the way to increased operating earnings. One-eighth of the purchase price would have been recovered and reserved each year, and the net earnings would have permitted payment of dividends without dipping into depreciation reserves.

The estimate of profitable life which management makes when equipment is purchased should lie between two extremes. If the estimate is for a period that is too short, the corporation will not be able after that period is ended to set aside any more of its earnings as a depreciation reserve for that equipment. It will be paying more taxes than it should after that period. If the profitable life is estimated too long, the original investment will not have been recovered by the time good judgment requires the replacement of the equipment.

It is to the national interest to set a short period of depreciation for equipment. This will clear the way for American plants to maintain the highest possible manufacturing efficiency. This is the road to lowered manufacturing costs and to a higher standard of living. The U. S. Treasury can't lose in any case. If the expected life is short, it will collect proportionately more taxes in the future; if too long, it collects more taxes in the present.

Management must not only recover its original investment but must set aside an additional reserve, since experience over the years has shown that there is a constant improvement in plant and equipment which is generally accompanied by higher prices.

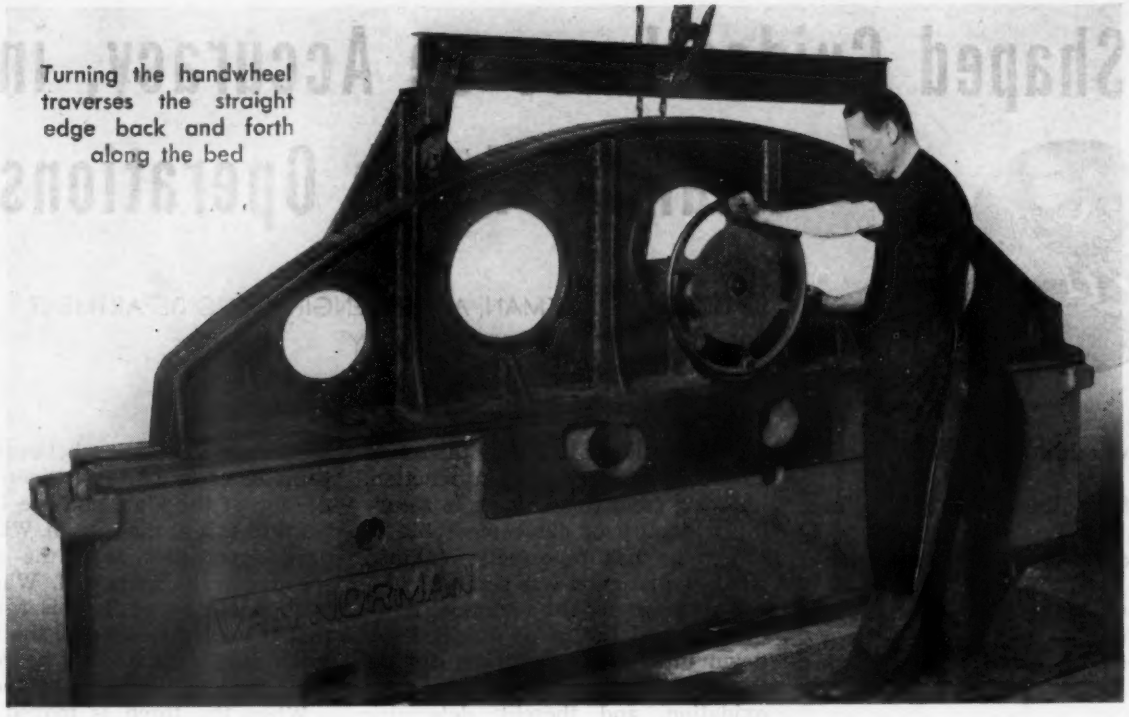
No company can keep its equipment in shape these days unless it keeps individual depreciation schedules for each machine, and schedules its depreciation not upon a basis of physical life of the equipment, but on a basis of obsolescence. The wise handling of depreciation policy has a great deal to do with the maintenance of employment and prosperity in the nation.

New Outlets Suggested for Small Firms

TO ASSIST MANUFACTURERS of the Oregon-Washington area to appraise the postwar possibilities of the field of equipment for transmission and distribution of electricity, the Bonneville Power Administration will display samples of the equipment and hardware items that are used in the construction and operation of electrical lines and substations. Exhibitions will be held in Portland, Seattle, Spokane and other cities of the area.

It is estimated that more than $7,000,000 will be expended for hardware equipment of this kind in this area during the first three postwar years, and it is believed that much of this equipment can be fabricated by local plants with a minimum amount of new tooling.

The program is especially designed to reach and inform the smaller firms, who, with the cessation of subcontracting on war goods, must find new outlets. Catalogs indicate the amount and time of projected needs, the methods of manufacture and specifications of the items that will be required.



Turning the handwheel traverses the straight edge back and forth along the bed

Gear-Driven Straight Edge

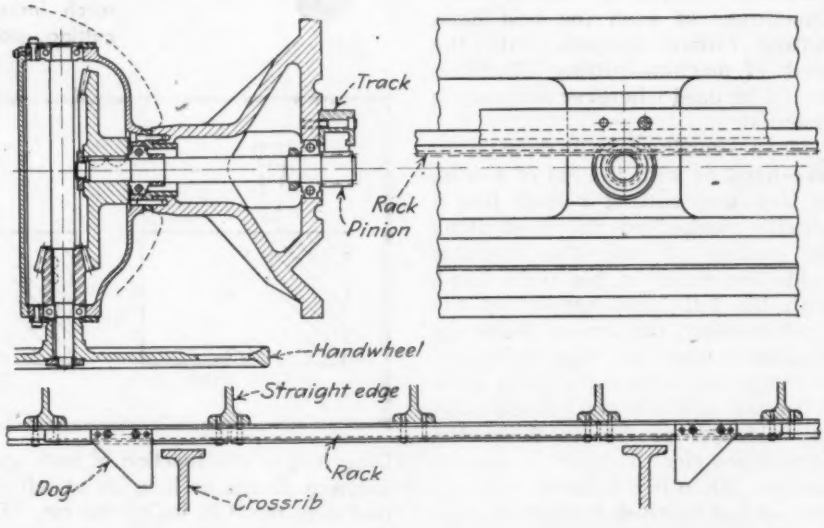
A LARGE STRAIGHT EDGE has been designed and constructed by the Van Norman Company to insure straightness and parallelism of the ways on its new line of crankshaft regrinding machines. This straight edge has been made with heavy sections to insure rigidity and when completely assembled weighs between 3,200 and 3,300 lb. It is 15 ft. long.

In accordance with common practice the straight edge is moved back and forth along the ways of the machine bed to observe its bearing and to scrape the ways to straight surfaces. Ordinarily several men would be needed to handle a straight edge of this kind; in this case, however, Van Norman tool engineers have designed a gear-driven actuator which makes it easy for one man to do this work.

The actuator consists of a handwheel bracket which is mounted at the center of the straight edge. The handwheel, when rotated, turns a bevel pinion which meshes with a large bevel gear on a vertical shaft. At the opposite end of a shaft is a spur pinion which engages a rack. The rack in turn carries two dogs which extend below cross ribs in the bed casting.

When the handwheel is rotated, the spur pinion is driven through the two bevel gears and pushes the rack longitudinally until one of the dogs comes in contact with the bed. At this point the rack is locked, and the force exerted on the handwheel causes the straight edge to move along the bed. Reversing the handwheel causes the opposite dog to engage the cross rib and moves the straight edge in the opposite direction.

An additional feature to facilitate ease of handling is a special yoke by means of which the straight edge may be lifted off and on the bed using a chain hoist.



Details of gearing, rack and dogs show how a plate beneath the straight edge engages the bed to apply the actuating force

Shaped Guides Increase Accuracy, in Manual Torch Operations

BY DR. G. V. SLOTTMAN, APPLIED ENGINEERING DEPARTMENT, AIR REDUCTION SALES COMPANY

A knowledge of cutting drag is important in hand operations. This article, the second in a continuing series, gives some pointers on hand flame cutting

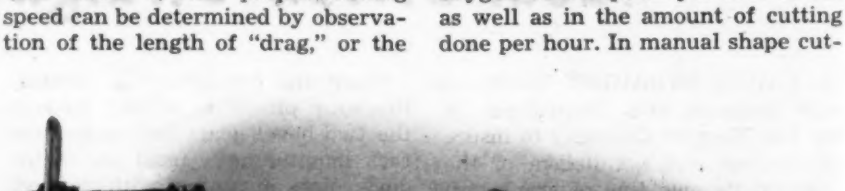
DESPITE the increasing mechanization of cutting practice, hand torch cutting maintains a prominent place in the cutting picture. Virtually all scrapping of steel structures is done by manual cutting, and it is used in foundries for removing gates and risers from steel castings. Rivet removal, gouging, veeing of cracks in broken pieces for welding, and a fair amount of production cutting is also done by hand.

In manual cutting the torch is held and guided by the operator, and accordingly the quality of the workmanship is dependent upon his skill. Torch manipulation is not difficult, and proficiency can be acquired by a conscientious operator in a short time. Nevertheless the accuracy and smoothness of even the best hand cutting cannot compare with the work of machine cutting. Machines should be used wherever accuracy is essential.

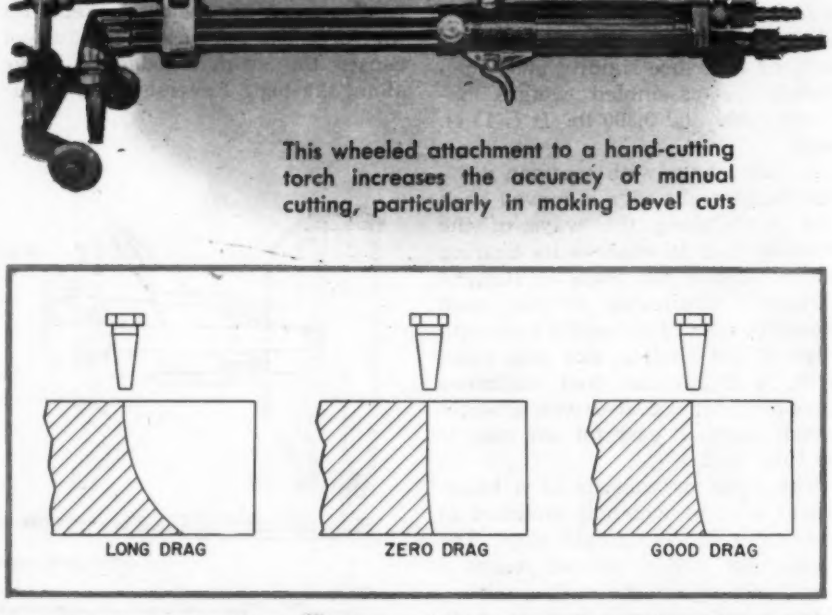
Manual cutting may be done either free-hand or with the aid of guides. In free-hand cutting a chalk line is usually marked on the steel along the outline of cut. The operator holds the torch in his right hand, with his left hand supporting the torch at about the center. After the beginning edge has been preheated to cherry red color the oxygen lever is pressed slowly to start the cut, and as oxidation progresses down the edge of the steel the valve is opened further. When it is fully opened and the cut has reached the bottom corner of the steel, the torch is moved at the proper speed along the desired line of cut. An experienced operator guides himself by the sound emitted by the oxidation reaction, knowing from this that he is securing a quality of cut comparable to others he has repeatedly obtained when the reaction was similar.

An inexperienced operator, however, should try to be able to look down into the kerf during cutting, to observe the slag flow and rate of oxidation, and thereby determine whether the speed of torch movement should be increased or decreased. Assuming that the size of tip and the gas pressures are correct for the thickness of steel being cut (see Table I) the proper cutting speed can be determined by observation of the length of "drag," or the horizontal distance between the point of entry of the oxygen jet at the top of the plate and the lagging point of exit at the bottom. When the drag approaches zero, the cutting speed may be increased. When the drag is too long, there is a danger that the cut may be lost; the rate of torch movement should be reduced until the length of drag is moderate.

When the torch is moved faster than the combustion reaction can take place, the reaction will cease altogether, but at the other extreme, "zero drag" in straight-line hand cutting is uneconomical in terms of oxygen consumption per foot of cut as well as in the amount of cutting done per hour. In manual shape cut-



This wheeled attachment to a hand-cutting torch increases the accuracy of manual cutting, particularly in making bevel cuts



Drag length is a function of both speed of torch motion and cutting oxygen pressure. Drags as long as at left are excessive, produce poor quality cuts and may result in losing the cut. "Zero" drag produces high quality cuts in machine cutting, but is only wasteful in hand cutting. Speed should be increased or pressure reduced. The length of drag shown at right will result in a fairly smooth cut, and may be moderately increased if desired

Guided hand cutting employs simple bar straightedges or jig-type guides such as those shown. The guide merely prevents wavering of the torch, and is used in exactly the same way as a ruler with a pencil. Those shown were designed to integrate a few minor hand-cutting operations into a production scheme which involved chiefly machine cutting. The machine is in operation while these cuts are made. Curved or irregular shaped guides can also be used

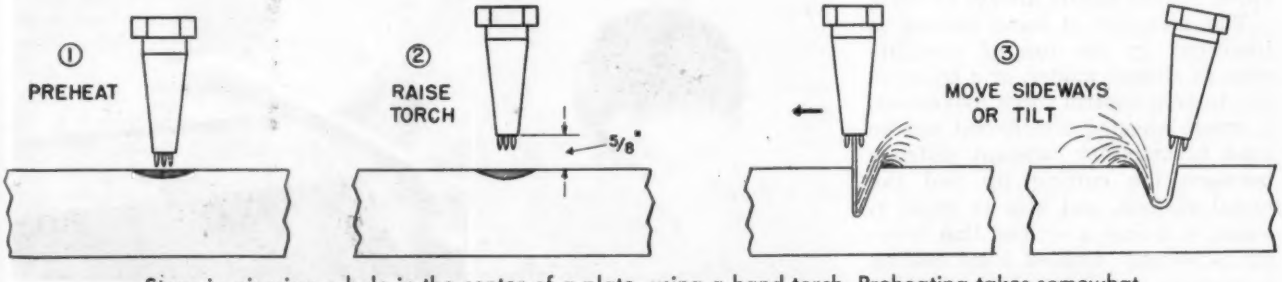
ting, however, zero drag may be necessary to secure perpendicular faces at changes in direction of cutting. In general, the drag may be made as long as is permissible to produce the straightness of face and quality of cut required of the job.

Because of variables involved in hand cutting, it is impractical to set up specific, tabulated figures of cutting speeds and gas consumption per foot of cut, for different thicknesses of metal. Probably the most important factor in rendering such figures little more than suggestive is the fact that kerf widths are never constant, because of variations between operators in the degree to which they allow the torch to waver. The empirical tables which manufacturers of cutting equipment provide usually list cutting speeds of anywhere from 50 to 90 percent of the speeds secured in machine torch cutting when using the same gas pressures and tip sizes. For most thicknesses the average speed is about ¼

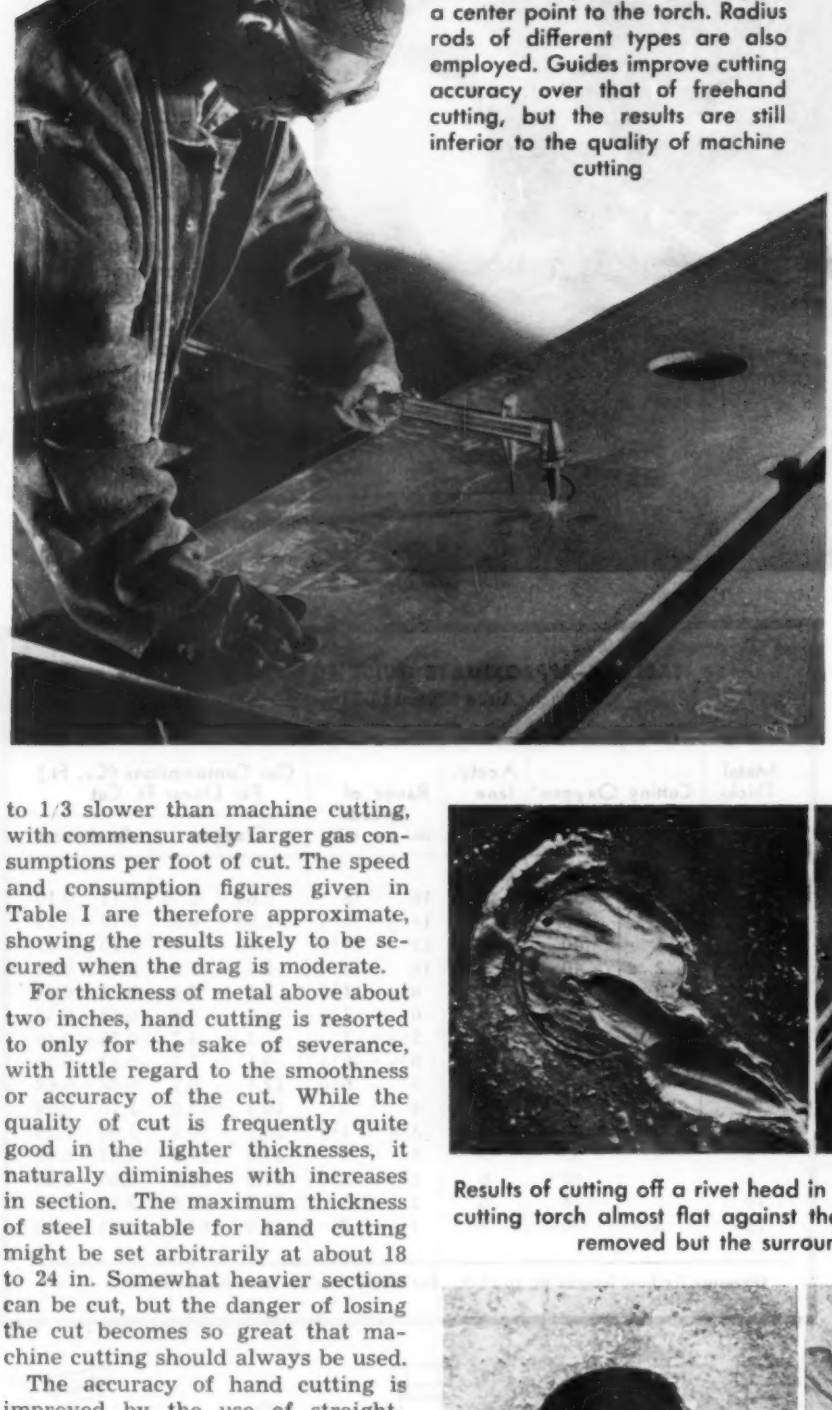
TABLE 1—APPROXIMATE GUIDE FOR HAND CUTTING
(Airco Style 124 Tips)

Metal Thickness, in.	Cutting Tip Size No.	Oxygen* Pressure psi.	Acetylene Pressure psi.	Range of Speeds in. per min.	Gas Consumptions (Cu. Ft.) Per Linear Ft. Cut	
					Oxygen	Acetylene
¼	0	30	3	16 – 18	0.63 – 0.56	0.11 – 0.10
⅜	1	30	3	14½ – 16½	1.03 – 0.85	0.17 – 0.15
½	1	40	3	12 – 14½	1.50 – 1.25	0.20 – 0.17
¾	2	40	3	10 – 13	2.4 – 1.9	0.28 – 0.22
1	2	50	3	8½ – 11½	3.3 – 2.4	0.33 – 0.24
1½	3	50	3	6 – 7½	6.2 – 4.8	0.53 – 0.43
2	4	50	3	5½ – 7	7.3 – 5.7	0.58 – 0.46
2½	4	50	3	5½ – 6½	9.1 – 7.7	0.62 – 0.52
3	5	50	4	5 – 6½	12.4 – 9.5	0.88 – 0.68
4	5	60	4	4 – 5	19.3 – 15.0	1.10 – 0.88
5	6	50	5	3½ – 4½	26.3 – 20.5	1.60 – 1.25
6	6	55	5	3 – 4	33.0 – 24.8	1.85 – 1.40
8	7	60	6	2½ – 3½	51.6 – 36.9	2.80 – 2.00
10	7	70	6	2 – 3	73.5 – 49.0	3.50 – 2.35
12	8	70	6	1½ – 2	117.0 – 87.5	5.35 – 4.00

*Pressure for hose lengths up to 25 ft. For longer hose use increased pressure.



Steps in piercing a hole in the center of a plate, using a hand torch. Preheating takes somewhat longer than when an edge is preheated, since heat is conducted away more rapidly. After ample preheating, the torch is raised and the oxygen jet opened slowly. The torch may then be either moved slowly to one side or tilted 15 to 20 degrees, to escape slag flying back



Guided hand cutting of small circles is accomplished by clamping a center point to the torch. Radius rods of different types are also employed. Guides improve cutting accuracy over that of freehand cutting, but the results are still inferior to the quality of machine cutting

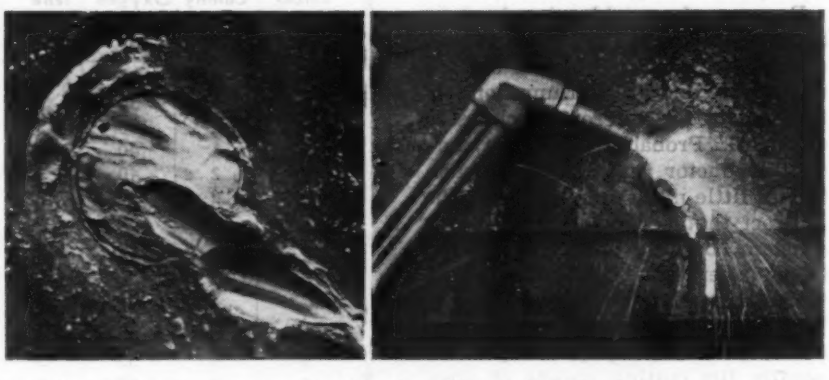
to 1/3 slower than machine cutting, with commensurately larger gas consumptions per foot of cut. The speed and consumption figures given in Table I are therefore approximate, showing the results likely to be secured when the drag is moderate.

For thickness of metal above about two inches, hand cutting is resorted to only for the sake of severance, with little regard to the smoothness or accuracy of the cut. While the quality of cut is frequently quite good in the lighter thicknesses, it naturally diminishes with increases in section. The maximum thickness of steel suitable for hand cutting might be set arbitrarily at about 18 to 24 in. Somewhat heavier sections can be cut, but the danger of losing the cut becomes so great that machine cutting should always be used.

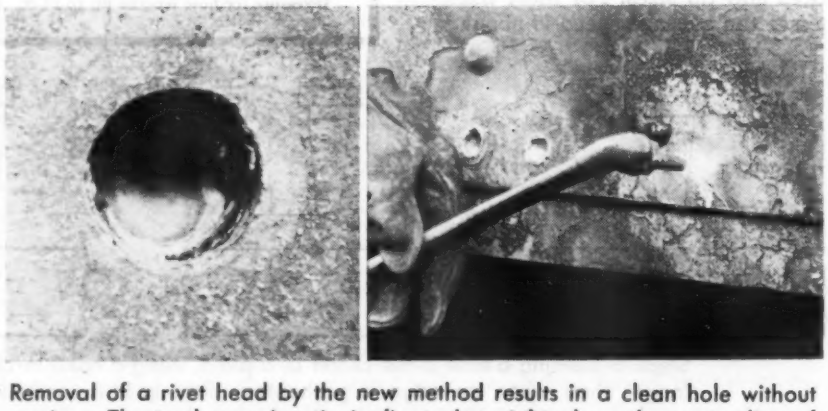
The accuracy of hand cutting is improved by the use of straight-edge or shaped guides, or a trammel bar to help control torch movement. A small wheeled attachment can be used to maintain constant distance between the cutting tip and the metal surface, and also to make it easier to follow a scribed line without wavering. Guided hand cutting is used on occasions when a cutting machine could not economically be brought into use, as on structures already erected, and in making certain cuts on structural shapes. A good illustration of the latter application is offered when templets are used in making guided hand cuts on beams previously split by machine cutting. The templets for such work are usually made of steel with the edge shaped as required and ground smooth to permit free sliding of the cutting tip against it. On shaped templets an allowance must be made for the distance between the finished working edge of the kerf and the side of the tip, as in designing any cam. The top surface should be at least ½ in. above the working surface to give leeway for vertical wavering of the torch.

Numerous designs of trammel or radius rods have been made, frequently by shop mechanics, to control horizontal movement of the hand torch when cutting arcs or circles. These usually comprise simply a clamp or socket to fit over the cutting tip, a rod attached to it and a center point which may be clamped to the rod at the radius desired.

One application of the hand torch is in piercing holes at points within the edge of a steel plate, to serve as starting holes for inside cuts to be made with either manual or machine



Results of cutting off a rivet head in the old way (left) by holding a standard cutting torch almost flat against the plate as shown at right. The head is removed but the surrounding plate is deeply scored



Removal of a rivet head by the new method results in a clean hole without scoring. The torch gouging tip is directed straight along the center line of the rivet, using a slight rotation to cover the whole head

torches. The hole should be burned in an area which will become scrap when the work is completed. A slightly different technique is followed in starting a piercing cut than when the cut is started at an edge, since until the oxygen jet has fully penetrated the steel, the slag flies back upwards where it might clog the end of the tip. To avoid this, the correct technique is to preheat the spot on the surface, then withdraw the tip until there is at least ½ in. of space between it and the plate before opening the oxygen valve. The torch is then tilted slightly or moved slowly to one side so that the slag will tend to fly out clear without blowing back against the tip. Piercing with a hand torch is successful on thicknesses up to about 6 or 8 in.; beyond that, an oxygen lance should be used for piercing.

The removal of old rivets can be accomplished by using the hand torch in either of two methods. The older method is to slice off the head of the rivet with a standard cutting tip, holding the torch as nearly flush as possible to the plate surface. This method cuts off the head, allowing the body of the rivet to be knocked out, but the high-velocity jet may also cut into and score the plate surface. Such scoring may not be bothersome in scrapping operations, but it is not desirable when the plate is to be used again.

Steel foundries have employed hand cutting widely to remove gates and risers from castings. Even in this application, however, machine cutting is fast supplanting the hand torch, since it makes smoother, closer cuts, requiring less finish grinding or none at all

The preferred method employs a large size, heavy preheat gouging tip, using a low oxygen pressure and thereby securing a low jet velocity. The style 144 No. 12 tip, having a cutting orifice almost ¼ in. in diameter, has been found satisfactory for removing either countersunk or buttonhead rivets. The torch is directed at the center of the rivet head, perpendicular to the plate, and the entire head is washed away in a few seconds using a circular, wiping motion. It is not necessary to withdraw the tip from the rivet when opening the oxygen valve, since the low pressure and velocity of the jet are insufficient to cause slag to fly back and clog the flame orifices. The surrounding plate metal is unaffected because the low-velocity jet cannot quickly penetrate the scale surface under the rivet or oxidize the base metal beneath. An acetylene pressure of 5 to 6 lb. and oxygen pressure of 20 to 25 lb. should be used for this operation.

The third article in this series will describe various types of cutting machines, requirements for installation, design of cutting tables, and auxiliary equipment.

Autobiography of Mike Rometer

BY GEORGE W. KEATING, PRODUCTION MANAGER, THE LUFKIN RULE COMPANY

MY NAME is Mike Rometer. I was born, well, sometime before Pearl Harbor and all the factors surrounding my emerging into the world were conducive to making me a thoroughbred. During my up-bringing I was impressed with the high ideals of integrity, dependability and truthfulness. "Tell the truth no matter whom it helps or hurts," was dinned into my very being and this became my slogan as I started my career.

When I left home I had everything—symmetry, accuracy, ratchet stop, lock nut, decimal equivalents and an adjustment that was simply tops. I first started work for a fellow named Charlie Brown, an honest-to-goodness toolmaker. Some thought him crabby but I didn't agree. He would get sore now and then, such as the time when a fellow workman doing a rough job on a wet grinder borrowed me for a few hours. Then he placed me back in Charlie's toolbox without drying me off. Fortunately Charlie discovered my condition in time to prevent any serious consequences, but he was sure mad at the other guy.

I never lied to Charlie, because he took good care of me. Occasionally after a hard day's work he would give me a drop of oil before putting me away in my plush-lined case. I remember one day Charlie had a heated argument with one of the big shot executives and I was called in to prove Charlie's point. I proudly told the truth, but they saw fit to double-check my word with some sort of an electrical measuring machine. The big shot, a fair-minded guy, admitted Charlie was right and apologized. That night when Charlie put me away the look in his eye plainly said, "Good boy Mike, you told 'em."

Then Charlie started getting promotions and he landed right on top. Nobody was surprised and even I was glad, although I knew it meant that Charlie wouldn't have much use for my services. Then he sold his toolbox and its contents, including me, to a new man named R. H. Bangs. He had a terrible temper and his initials "R.H." soon had him dubbed "Rough House" by his coworkers.

I became down-hearted and disgusted. He'd get sore and throw me around in the midst of chips and dirt. If he took too deep a cut, he blamed me. It wasn't long before my sleeve was marred, my face scratched and there was grit in my threads. Worst of all, my frame was out of shape. I finally reached a point where I just lied all the time.

Finally R.H. pawned me and whatever he received was too much. I'm not even good enough for the production line to say nothing about dies and fixtures. I know my days of usefulness are ended and I'm ready for the scrap heap and wish I was there, just because R.H. didn't give me a break. I hope that someone will profit from my life's story.

Bearing Lands and Negative Rakes Prolong Cutting Tool Life

BY MARK W. PURSER

Important progress in solution of wear, chatter and set-up of cutting tools made by lapping slight land just below cutting edge and by stoning a negative rake around this cutting edge

MATERIAL INCREASES in tool life have been made by polishing tool surfaces to a mirror finish and cushioning tool tips with silver-soldered sheet copper inserts. Now another step in the right direction has been made, in which it has been shown that tool life can be lengthened, depth and speed of cut increased and finish improved if a slight negative rake is stoned all around the cutting edge of a tool and a slight land lapped under the cutting edge of a tool. This principle may be applied on almost any type of machining cut, whether on a lathe, shaper or planer. It may even be applied to drilling and milling.

The width and angle of this negative rake, as well as the width of land, is subject to variation. The former depends largely on the feed, and the latter on the material to be machined and, in the case of a lathe cut, on the feed and workpiece diameter. The greater the feed, the less the width of land required.

The basic idea behind this type of tool is to cause the resultant forces of chip pressure and workpiece pressure on the cutting edge to be in such a direction as to compress the tool particles at the cutting edge into the tool, instead of tending to tear them off the tool. The land causes a unit pressure just below the cutting edge, equal to or slightly higher than the workpiece pressure at the cutting edge. This bearing tends to steady and support the cutting edge, reduce chatter and prevent minute particles of the cutting edge from breaking off and getting wedged between the tool edge and workpiece. If the land is too wide, excessive friction results.

By reducing tool vibration, fatigue at the cutting edge is reduced and tool life lengthened. Actually this is decreasing the depth of chatter, and the degree of spring of its holding and feed mechanism, but increasing the frequency of this action. As a result the chip shearing action occurs more rapidly and the rough side of the chip appears to show finer ridges than would otherwise be the case. This means that the rate of intermittent shearing action, which takes place in forming the chip, is increased.

There can be no stress without a strain, nor can metal be machined without some distortion of tool, workpiece and chip. However, as long as this distortion is kept within the elastic limits of the workpiece, the tool and its supporting mechanism, the tool will intermittently spring back to its natural position. The greater the frequency and the less the amplitude of this tool spring or vibration, the finer the finish and the longer the life of the tool.

A tool which is newly ground in the conventional manner does not provide as good a finish as one which has been used to some extent. This is because the tool must first establish a bearing below its cutting edge to give good finish. If the tiny width of negative rake at the cutting edge

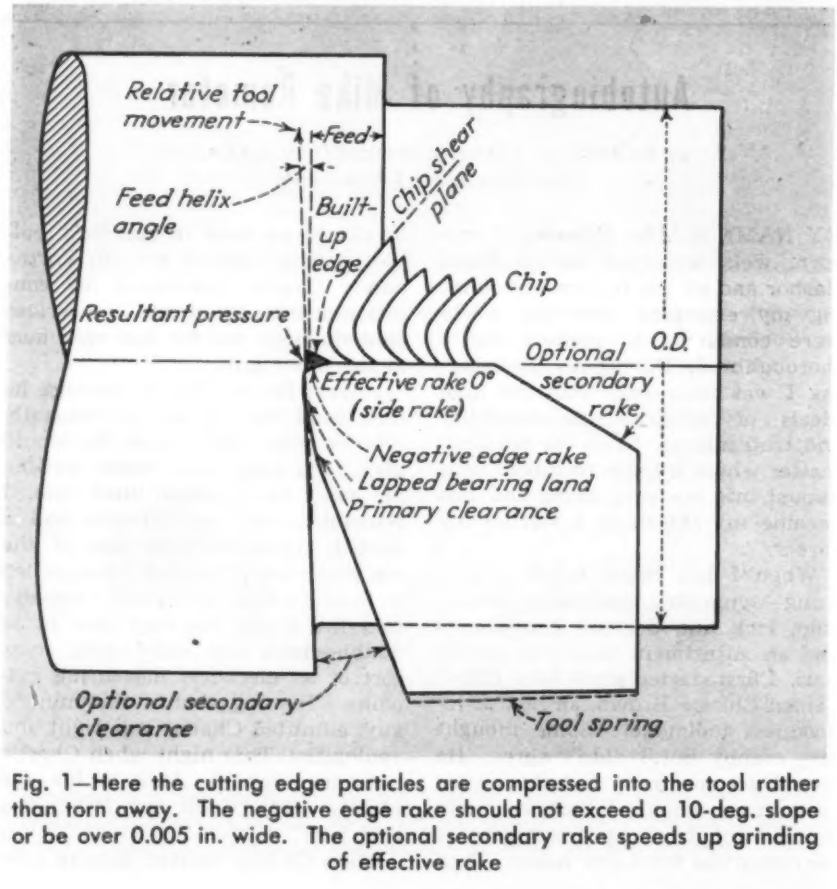


Fig. 1—Here the cutting edge particles are compressed into the tool rather than torn away. The negative edge rake should not exceed a 10-deg. slope or be over 0.005 in. wide. The optional secondary rake speeds up grinding of effective rake

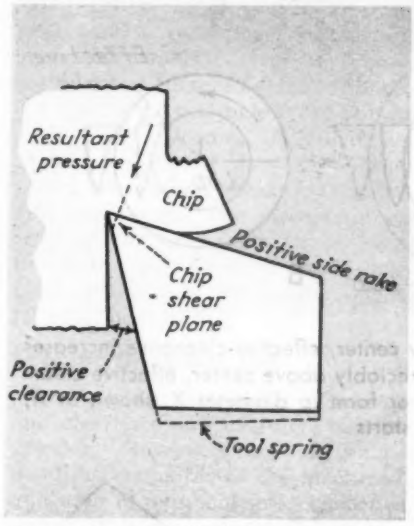


Fig. 2—Uncontrolled bearing below the cutting edge is caused by the tendency of cutting edge particles to shear off along the chip shear plane. Tool spring is exaggerated by lack of support below the cutting edge

is too wide or too steep, it may cause chip-wedging and thumping of the toolpost against the feed mechanism. Furthermore, it may impede the flow of chips across the tool face.

The land can be lapped all around below the cutting edge with a diamond-impregnated lapping wheel. However, it may often be accomplished more quickly and effectively by lapping the tool against the actual workpiece after the tool is rigidly set in working position. With a turning tool this type of lapping quickly establishes a natural bearing all along the cutting edge, including the nose radius.

To lap a turning tool land a small length of the diameter is first turned down to full depth of the first cut. The spindle is then stopped, and a thin layer of lapping compound is applied to the workpiece where it contacts the tool. When using cemented-carbide tools, some lapping compounds such as oil with fine-grit diamond, boron carbide or synthetic sapphire should be used.

The spindle then is run in rapid reverse with the feed disengaged. The tool is held against the workpiece in cutting position for a few moments, by means of the handwheels on the carriage and cross-slide. This lapping operation should immediately follow stoning of the slight negative edge rake. Tools prepared in this way do not wear down so much between grinds and it is much easier to hold required tolerances.

For a facing or forming tool, the tool should be set on center and the lapping done with the spindle in reverse at the largest permissible workpiece diameter, with the whole of the cutting edge contacting the workpiece.

The sketches in Fig. 5 show how, on a facing or forming cut with the tool on or below center, lapping to a larger diameter causes the tool clearance to increase as the workpiece diameter is reduced. They also show how, on a facing or forming cut with the tool set appreciably above center, lapping to a large diameter causes tool clearance to decrease as workpiece diameter is reduced.

In the case of a drill or a milling cutter, it is merely necessary to start the cut, withdraw the tool, apply the lapping compound to the machined part of the workpiece, run the tool rapidly in reverse, and bring it up against the lapping surface by hand for a few seconds. Care should be taken not to use excessive lapping compound and to wipe off any surplus compound after the operation is completed—otherwise it may damage the bearing surfaces of the machine.

In a turning cut, because of the helix angle of feed, the land actually causes a slight negative clearance right below the cutting edge. This has a slight burnishing effect on the workpiece. The same thing holds true for a drill or a milling cutter with a lapped land just below the cutting edge.

In an orthodox tool, without this land, microscopic chips are torn from the cutting edge as soon as the tool starts to wear. This causes uncontrolled negative clearance, which varies below different parts of the cutting edge. By properly lapping the land at the start, this negative clearance can be controlled scientifically to give maximum tool life and optimum finish on the workpiece.

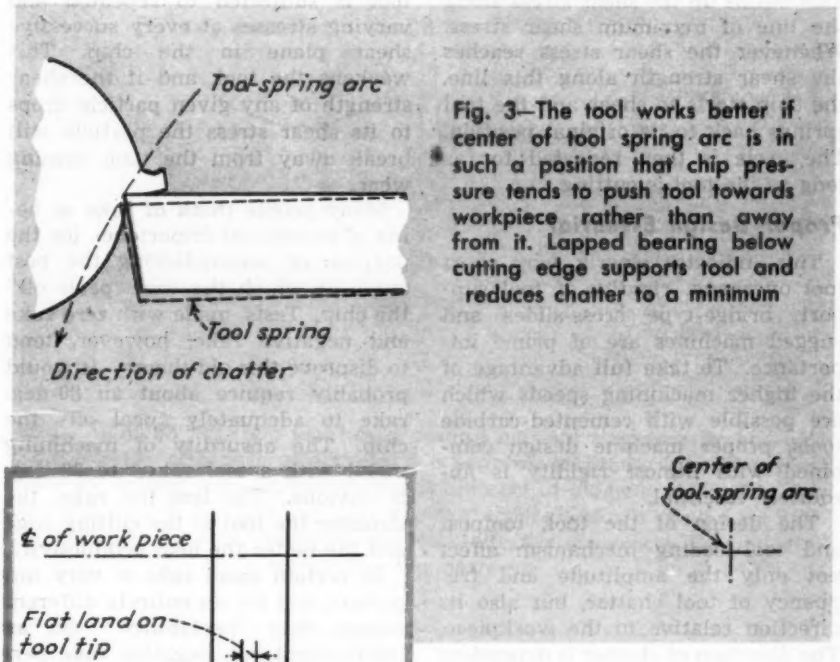


Fig. 3—The tool works better if center of tool spring arc is in such a position that chip pressure tends to push tool towards workpiece rather than away from it. Lapped bearing below cutting edge supports tool and reduces chatter to a minimum

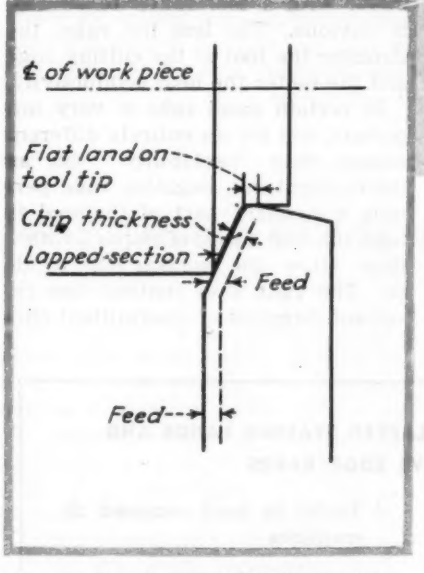


Fig. 4—The flat land on the tool tip, parallel to the workpiece axis, should equal the feed for best finish. Tool is fed to maximum depth of cut for lapping the land

The old idea of raising a turning tool "above center" to prevent chatter simply causes interference at the tool tip. This is the point where the cutting edge is weakest, and where the least cutting takes place. It is making one small part of the tool responsible for reducing all the chatter caused by the chip pressure over the whole of the cutting edge. Controlled bearing should take place below the whole of the cutting edge—not just below one tiny portion of it.

The following explanation is prob-

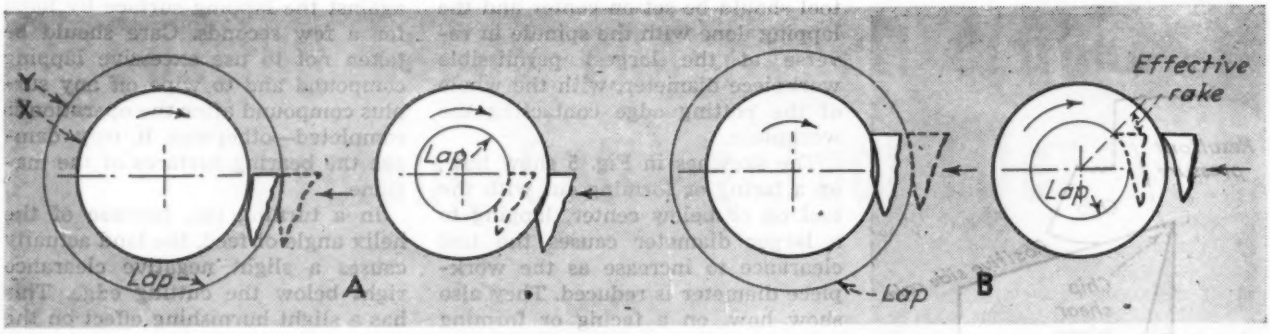


Fig. 5—On a facing or forming, with the whole of the cutting edge on or below center, effective clearance increases as tool feeds in to smaller diameter, as shown at *A*. With the cutting edge appreciably above center, effective clearance decreases as the tool feeds to smaller diameter as shown at *B*. To face or form to diameter *X*, shown at *A*, bearing should be lapped at *Y*, where the cut starts

ably an approximation of what actually happens in chip formation. As chip pressure builds up the tool and its holding mechanism are sprung slightly, as shown by the dotted lines in Figs. 1, 2, and 3. This builds up the shear stress along the line of maximum shear stress. Whenever the shear stress reaches the shear strength along this line, the chip starts to shear and the tool springs back to its original position. The cycle is then repeated for as long as the tool is cutting.

Proper Design Essential

This indicates clearly why short tool overhang, rigidity of tool support, bridge-type cross-slides and rugged machines are of prime importance. To take full advantage of the higher machining speeds which are possible with cemented-carbide tools, proper machine design combined with utmost rigidity is absolutely essential.

The design of the tool, toolpost and tool-feeding mechanism affect not only the amplitude and frequency of tool chatter, but also its direction relative to the workpiece. The direction of chatter is dependent on the position of the mean center, or fulcrum, about which the tool chatters, as shown in Fig. 3. If this mean center point be in such a position that the tool tends to vibrate toward and against the workpiece, rather than away from it, chatter will be reduced.

While it is difficult to theorize on the subject of tool wear, it appears to be largely caused by fatigue. The tool is subjected to repeated and varying stresses at every successive shear plane in the chip. This weakens the tool, and if the shear strength of any given particle drops to its shear stress the particle will break away from the tool, causing wear.

Many people think of rake as being of paramount importance for the purpose of accomplishing the best angle at which the tool "peels off" the chip. Tests, made with zero rake and negative rake, however, tend to disprove this old theory. It would probably require about an 80-deg. rake to adequately "peel off" the chip. The absurdity of machining metal with a tool raked to 80 deg. is obvious. The less the rake, the stronger the tool at the cutting edge and the better the heat conductivity.

In certain cases rake is very important, but for an entirely different reason than "peelability." On an intermittent cut, negative rake permits a stronger part of the tool to take the first shock of impact, rather than allow the weaker tip to do so. The rake also controls the resultant direction of intermittent chip

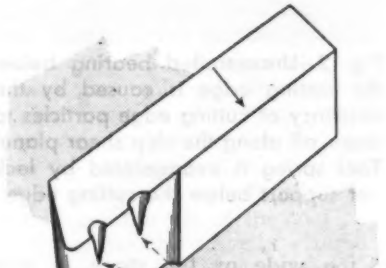


Fig. 6—This type of cavity, caused by tool particles breaking away, causes intermittent and uncontrolled rubbing. Chip particles wedge into these cavities and cause further breakdown of the cutting edge. Controlled bearing, accomplished by proper lapping, greatly reduces this trouble

pressure on the tool. A tool with too much rake tends to be drawn away from the feed mechanism and to dig intermittently into the work, thus causing chatter marks, poor finish and difficulty in holding size. A tool with too much negative rake tends to be pushed hard against the tool-holding and feeding mechanisms by the chips, which causes thumping and chatter. It is also one reason why the width and steepness of the negative edge rake in Fig. 1 may not be excessive.

In the case of a tool having clearance and no lapped land below the cutting edge, rake largely controls the bearing between all the different parts of the cutting edge and the workpiece, as shown in Fig. 7. For instance, in the case of a forming tool, increasing rake causes relatively greater effective clearance at that part of the cutting edge which is forming the largest diameter, and relatively less effective clearance at that part of the cutting edge which is forming the smaller diameter. The

ADVANTAGES OF PROPERLY LAPPED BEARING LANDS AND SLIGHT NEGATIVE EDGE RAKES

1 Longer tool life
2 Improved finish
3 Less control of nominal rake and clearance angles required
4 Easier to hold required dimensions
5 Set-up speeded through greater ease of locating tools in machine

same theory can be proved by practical test to hold true for turning and facing tools.

When the correct amount of bearing land is lapped below the cutting edge, rake becomes of much less importance as a bearing control factor, and hence of much less general importance. The correct natural bearing for each and every point below the cutting edge has already been established by means of the lapping operation.

Specific Data Needed

The terms back rake, side rake and clearance, are useful to the tool grinder. However, they are almost meaningless as far as the machining qualities of the tool are concerned, unless it is also specified just how the tool is to be set in the machine, relative to the workpiece and to the direction of feed. The term "on center" is another expression often used loosely—especially in the case of roller-turner and boring tools. Where a lathe facing or turning tool is used on the cross-slide, "on center" usually means that the tip of the tool is on an axial plane of the workpiece which is parallel to the cross-slide movement. In the case of roller-turners, thread-cutting dieheads, and certain lathes in which the tools swing through an arc into the workpiece, there is room for a great deal of debate as to just what the term "on center" is supposed to mean.

One of the greatest advantages in preparing tools in the manner outlined is that good operation of the tools is far less dependent on having the nominal rakes and clearances skillfully ground, than on having the tool set in the machine properly.

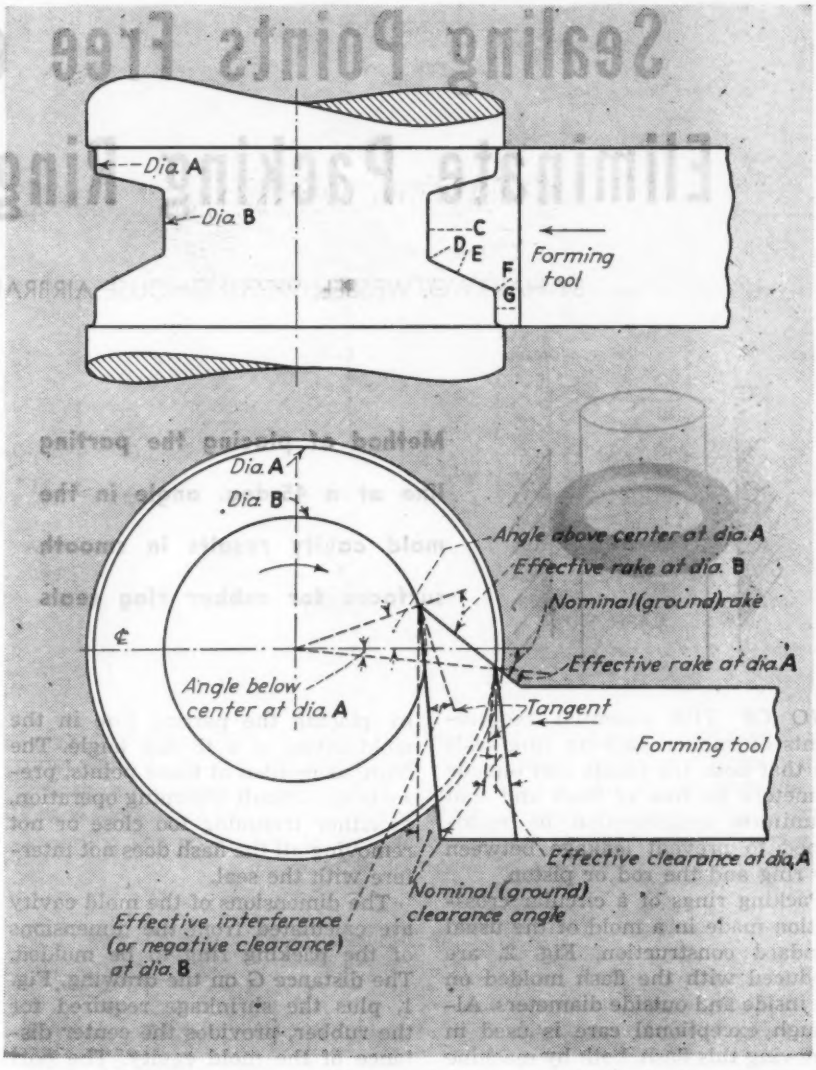


Fig. 7—Although this form tool has a positive nominal clearance ground on it, the effective clearance at diameter B is negative and there is bearing just below the cutting edge. Effective rake is different at diameter A than at diameter B despite the fact that only one flat nominal rake is ground on the tool face. As the tool feeds into the work effective rake increases and effective bearing decreases

Preheating Avoided in Electric Welding of Kirksite Die

BY E. W. SCHWANZ, FLOUR CITY ORNAMENTAL IRON COMPANY

A LARGE Kirksite die was welded in our shop without preheating—a process that has been generally considered impossible. The usual procedure is to preheat the die to 300 to 400 F. and use an oxyacetylene torch.

The die in this case was 6 ft. in diameter and weighed 9,000 lb. It was necessary to enlarge the die 3/32 in. on a band 8 in. wide around the entire circumference. The size made preheating impractical. The die was welded using a carbon arc with an electric welder and filler rods cut from ¼ in. Kirksite sheet. These rods were cut in widths of ¼ in. and 3 ft. lengths. The machine was set at 400 amp. and a ¼-in. carbon electrode was used. The die was positioned so that welding was always done downhand. The beads were laid close together.

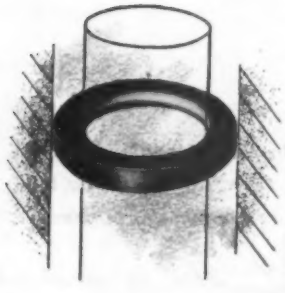
Time required to weld a band 3/16 in. high, 8 in. wide around the 19 ft. circumference was 8 hr. No flux was required. After two days required to dress and shape the die it was ready for use. It is still in good shape after making about 2,000 impressions.

In welding Kirksite with carbon arc a dangerous zinc vapor is formed. A small blower was used which drew in air through a 4 in. flexible tube placed just ahead of the welding area. The blower exhaust was led through a window by another flexible tube.

Had preheating been necessary in this case the die would have been scrapped. It is believed that even in cases where preheating is possible, a labor saving of about 80 percent can be achieved by using the technique described.

Sealing Points Free of Flash Eliminate Packing Ring Leakage

BY HARRY G. WESSEL, WESTINGHOUSE AIRBRAKE COMPANY



Method of placing the parting line at a 45-deg. angle in the mold cavity results in smooth surfaces for rubber ring seals

TWO OF THE essential requirements of rubber packing ring seals are that both the inside and outside diameters be free of flash and that a uniform cross-section be maintained to prevent leakage between the ring and the rod or piston.

Packing rings of a circular cross-section made in a mold of the usual standard construction, Fig. 2, are produced with the flash molded on the inside and outside diameters. Although exceptional care is used in removing this flash, both by machine and hand methods, most rings are rejected because of leakage caused by not having the flash trimmed close enough, or to the reverse condition of trimming too much.

A mold can be made, as shown by Fig. 3, to mold the flash at a position other than the sealing points of the packing ring. This is accomplished by placing the parting line in the mold cavity at a 45-deg. angle. The flash, as molded at these points, presents no difficult trimming operation, as either trimming too close or not removing all the flash does not interfere with the seal.

The dimensions of the mold cavity are calculated from the dimensions of the packing ring to be molded. The distance *G* on the drawing, Fig. 1, plus the shrinkage required for the rubber, provides the center distance of the mold cavity. The part drawing for the packing ring also provides the dimension used for *T* radius. The center distance of the radius *T*, Fig. 4, on the preliminary machining portion can then be calculated, and by adding twice *T*, dimension *X* is the result, and dimension *W* can be obtained from this center distance. By machining to dimensions *W* and *X* with a tool having radius *T* we have a point on the radius which is tangent to the 45-deg. angle line shown as *S*. The compound slide of the lathe is then set at a 45-deg. angle and with a form tool made with radius *T*, the mold cavity can be machined by feeding the form tool along line *S*. The positioning of the form tool is correct when it touches the point of tangency of radius *T* with line *S*. The cavity is then machined to the inside diameter of the cavity.

The dimensions for the lower half of the mold, Fig. 5, are calculated in a similar manner except that twice radius *T* is subtracted from the center distance of the mold cavity to arrive at dimensions *P* and *R*. Dimensions *P*, *R*, and radius T are machined accurately in the preliminary operation. With the compound slide of the engine lathe set to the 45-deg. angle, the form tool is fed along line *S* to finish the mold cavity. The depth of the cut in this case is correct when the outside diameter of the mold cavity reaches the required dimension.

A circular packing ring shown in Fig. 6 has a radius on the inside diameter only, the outside diameter being a straight surface. The type of mold generally used for a ring of this kind, Fig. 7, produces a molded

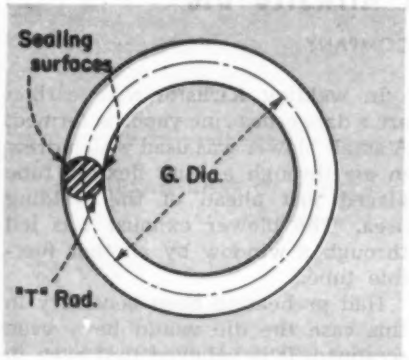


Fig. 1—The most common rubber sealing ring is the circular ring type which seals at the maximum and minimum diameters on circular arcs

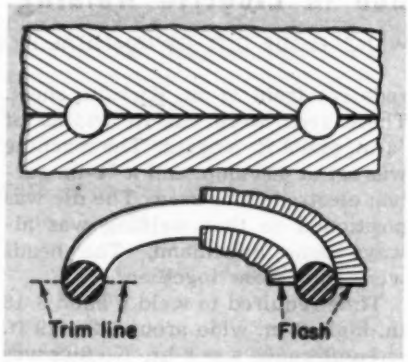


Fig. 2—When the circular seal is made in a standard mold, flash is formed at the sealing surfaces and requires accurate removal

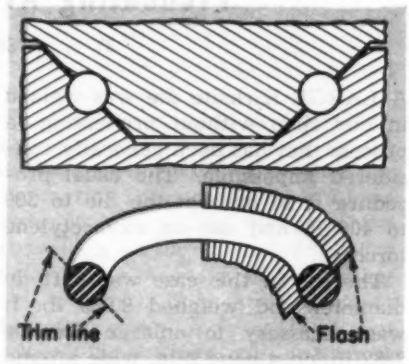


Fig. 3—Molding the ring with a 45 deg. angle at the parting produces a part with the flash located away from the sealing surfaces

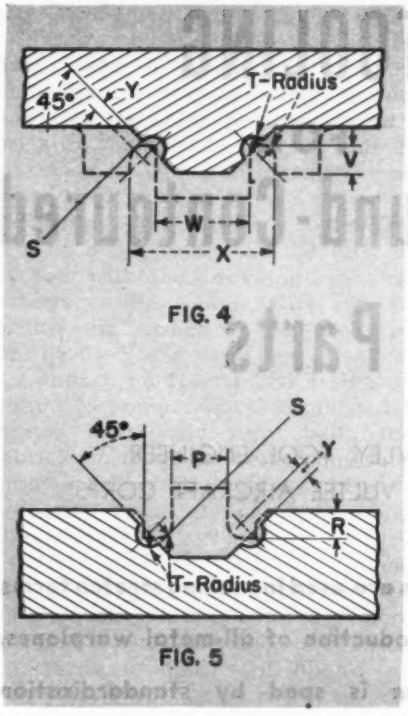


FIG. 4

FIG. 5

Fig. 4—Upper section of the mold is machined to maintain the center of the mold cavity at the parting line. Fig. 5—Lower mold section is finished to match dimensions maintained in the upper section

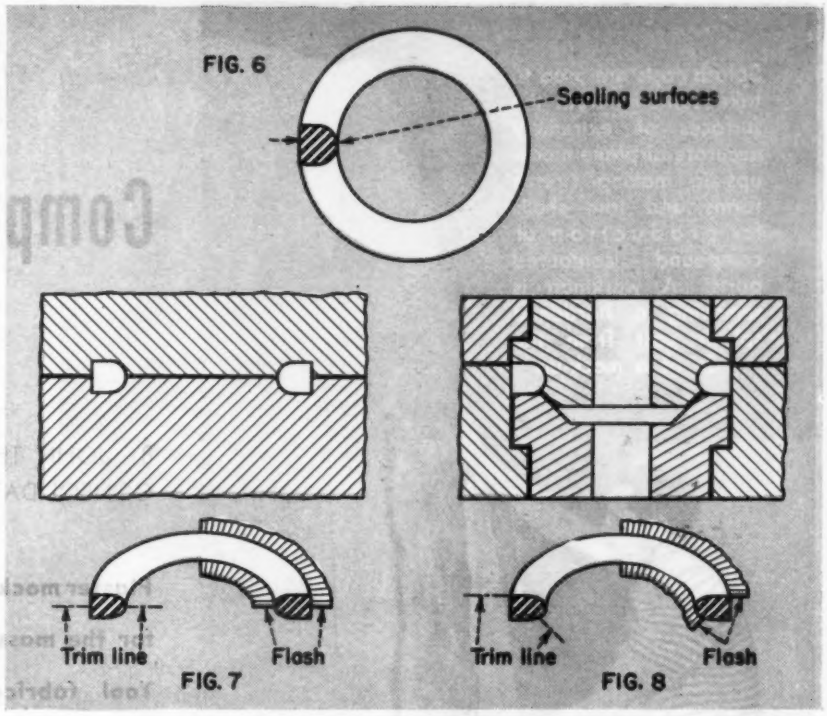


Fig. 6—Another type of rubber seal has a flat section on its maximum diameter with a circular arc inside. Fig. 7—Standard mold construction leaves flash at the diameters of the ring. Inaccurate removal of flash from the outside diameter is not serious because of the large contact area. Fig. 8—Inside parting line at 45 deg. to the diameter places the flash where clearance is available to permit inaccuracies

piece with the flash at the maximum and minimum diameter. With the flash molded in this position, the trimming operation presents the same difficulties encountered with packing rings of circular cross-section.

An enlarged partial section of a new design of mold for this packing ring is shown in Fig. 8. In this mold the packing ring is produced with the flash molded so that the trimming operation is performed at points which are not required to act as a seal.

The construction is arranged to permit accurate machining of the mold cavity in both inserts at one setting and thus insure that the cavities will mate when closed.

The inserts are machined to approximate shape, Fig. 9, with dimension *F* turned oversize. Dimension *E* for the holes are finish bored to fit the mandrel. Dimension *G* is made the same size as the center distance for the radii of the mold cavity. In the preliminary operation the inserts are machined so that when assembled together on the mandrel the 45-deg. angle portions of each one and the faces shown at *H* are in contact.

To finish the mold inserts they are mounted on the mandrel and the outside diameter machined to a press

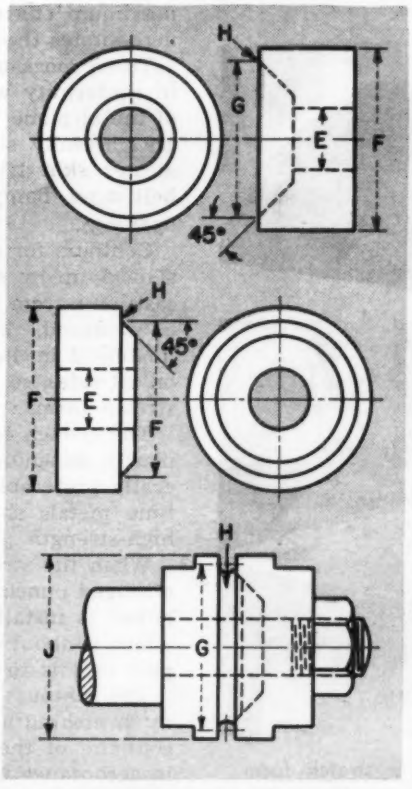


Fig. 9—Both sections of the mold are placed together on a mandrel and the mold cavity machined to insure accuracy of contour and alignment of molds when placed in the plate

fit size for the upper and lower mold plates. Using line *H* as the center line of the radius of a form tool, the mold cavity is machined to the inside diameter of the mold cavity. The outside diameter of the mold cavity is obtained by making dimension *J* equal to the outside diameter of the ring plus the shrinkage. In machining the mold cavity on line *H* to the correct depth, the faces shown as *H* are removed, leaving the match line of the molded ring on the 45-deg. faces which are still in contact. This method of machining the mold cavity assures a perfect match of the completed radii.

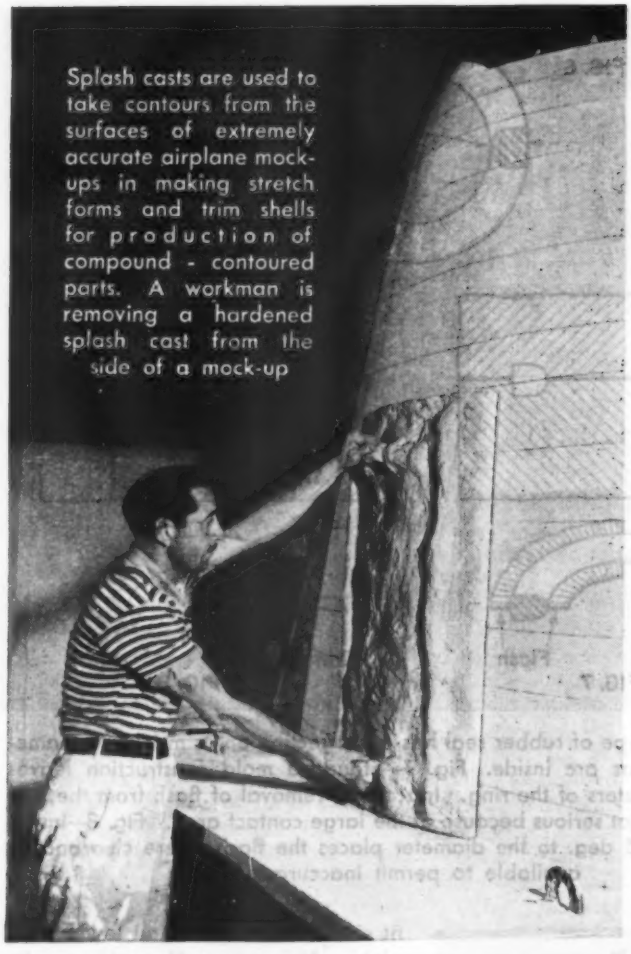
The method used in detailing the steps or operations necesary to make either type of mold enables the toolmaker to produce an exceptionally accurate mold which is reflected in the nearly perfect packing rings produced.

Although the construction of molds of this type appears to be time-consuming and unnecessary for a simple molding, the savings in rejections and time required for flash removal compensate for the added mold cost. In addition, possibilities of failure after installation are materially reduced and costs of replacement due to such failure are reduced in direct proportion.

TOOLING FOR Compound-Contoured Parts

BY JOHN THAWLEY, TOOL ENGINEER,
CONSOLIDATED VULTEE AIRCRAFT CORP.

Plaster mock-ups are used in making stretch forms for the mass production of all-metal warplanes. Tool fabrication is sped by standardization



Splash casts are used to take contours from the surfaces of extremely accurate airplane mock-ups in making stretch forms and trim shells for production of compound - contoured parts. A workman is removing a hardened splash cast from the side of a mock-up

Proper surfacing is necessary after a stretch form has been cast. A splash cast shown above the form can be used as a blueing block to ascertain that the mock-up contours are reproduced accurately by the stretch form

THE JOB OF TOOLING to produce compound-contoured parts from aluminum-alloy sheet is generally considered one of the most difficult tasks involved in the mass-production of all-metal warplanes. However, at Consolidated Vultee Aircraft Corporation, it is believed that this work is now being accomplished with maximum efficiency by means of a procedure which necessitates the use of contour models or mock-ups.

These mock-ups are made of plaster and surfaced in conformity with the inside mold lines of the skin of the airplane which is to be constructed. Then they are carefully scribed with a lines layout which indicates skin trim lines, stringer heels, bulkhead or beltframe flanges, and trim lines for cut-outs or openings.

Contours for a given section of skin are taken from a mock-up by means of a plaster or hydrocal splash cast; and, from this splash cast, a plaster male pattern is produced. The male pattern should be approximately 2 in. larger than the actual trim of the skin on all sides, so that it can be used in making a cored stretch form.

The stretch form may be cast in either Kirksite or plastic, depending on its size or bulk. Kirksite is generally preferable for this type of work, but the wartime metals shortage has made it necessary to use high-strength plastics whenever possible.

When the stretch form has been properly surfaced, a hinged punch (which can be used to pierce locating holes) is installed on each end of the die at a point which is about a half-inch beyond the trim line of the part that is to be stretched.

The contours of the stretch form or die are proofed by stretching a test part and checking it against the contours of the mock-up. Then the part is trimmed in accordance with the actual trim lines on the mock-up, so that it can be used in making a "trim shell."

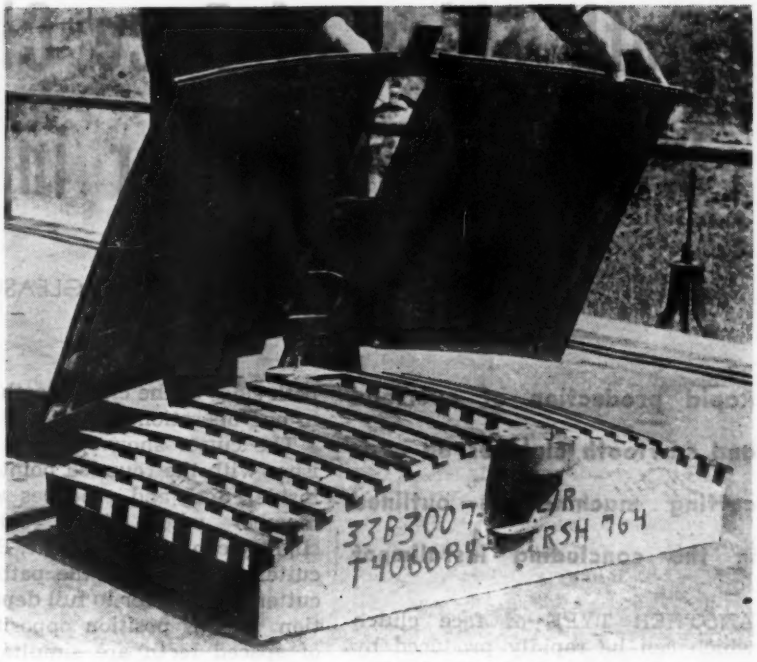
The trim shell comprises a male wooden backing form, which is made in conformity with the contours of the previously used splash cast, and the sample part, which must be suitably reinforced or stiffened

with strips of ⅛ × 1 in. cold-rolled steel after it has been trimmed.

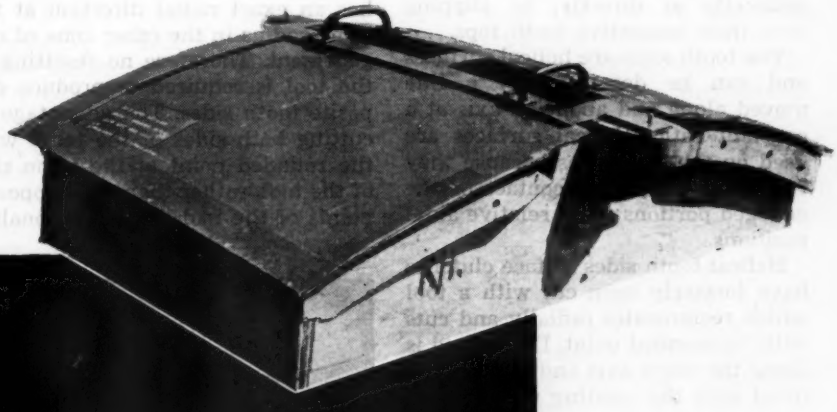
Locating pins on the wooden backing form make it possible to position both test and production parts thereon by means of the holes that are pierced in the parts on the stretch die; and this enables workmen to trim each production unit in strict conformity with the dimensions on the sample part. Either a Kodie-Kay trim saw or a pin router can be used in connection with the trimming operations. If necessary, the sample part can also be drilled and bushed so that the trim shell can be used as a drill jig.

Although no special tool designs are required to produce the Consolidated Vultee stretch forms and trim shells, the tool fabrication work can be accomplished with both speed and accuracy because the necessary procedure has been completely standardized.

Interchangeable skin-trim dimensions are dependent only upon the accuracy with which locating holes are pierced in the production parts; and, since these holes are made by means of hinged punches on the dies as soon as each part has been fully stretched, the chances for poor coordination are extremely slight.



A trim shell comprises a male wooden backing form and a sample part, the latter suitably reinforced or stiffened with strips of ⅛ × 1 in. cold-rolled steel after it has been trimmed. Locating pins on the wooden backing form permit positioning of test and production parts which are pierced with holes on the stretch die



The complete trim shell shown is used in trimming contoured parts that have been formed over a die on an Erco stretch press. If necessary, the upper part of this tool could be drilled and bushed so that it could also function as a drill jig

Hinged punches on a stretch die are used to locate holes in a production part which has been fully stretched. Accuracy of the hole locations determines the interchangeability of the trim dimensions of the production part

Both Sides of Face Clutch Teeth Cut With Single Cutter in One Operation

BY ERNEST WILDHABER, GLEASON WORKS

Rapid production of overload and sawtooth clutches on gear cutting machines is outlined in the concluding installment

ANOTHER TYPE of face clutch which can be rapidly produced by the Curvic process is the overload or load-releasing clutch. Engagement of the mating members is maintained by spring pressure. When an excess load is imposed on the unit the two mating clutch members move apart axially and shut off the load, either indirectly or directly, by slipping over their respective tooth tops.

The tooth sides are helical surfaces and can be described by a line moved along and about an axis at a constant ratio. Helical surfaces are used on these clutches because they can maintain proper contact of the engaged portions at all relative axial positions.

Helical tooth sides of face clutches have formerly been cut with a tool which reciprocates radially and cuts with its rounded point. Depth feed is along the work axis and is synchronized with the rotating work. Separate operations are required to cut opposite sides of these teeth. They are cut with opposite tool points which must reciprocate in a radial path when cutting. This could not be done without changing the tool position between the cutting of opposite sides.

This rather slow process could be speeded up by using a machine with multiple toolslides. However, this is a special machine restricted to given tooth numbers of the clutch and is at some disadvantage in producing accurately spaced teeth.

In the Curvic process, described in an earlier installment, a rotating cutter of the face mill type is used. Although this tool also cuts with the rounded point there are many blades to share the work. Each of the blades has time to cool off between cuts and both sides of the clutch teeth are cut in one operation.

The cutter shown in Fig. 10 finishes with the rounded points of the inside edges and produces a clutch member whose tooth sides are slightly convex lengthwise. Both the cutter, Fig. 10, and the path of the cutter points refer to full depth position. In this position opposite sides of spaced teeth are simultaneously engaged near the tooth bottom. Both sides are finished with the same points of the cutter and their path is symmetrical in both zones of cutting engagement. If it has an exact radial direction at a given mean radius in one zone of engagement, it also has an exact radial direction at the same radius in the other zone of engagement. Therefore no resetting of the tool is required to produce opposite tooth sides. The advantage of cutting both sides of the teeth with the rounded point at the same side of the tool, rather than with opposite points of the tool, is unquestionable.

The cutter is rotated on an axis parallel to the work axis. The work is uniformly turned on its axis while uniform depth feed along this axis is provided between the cutter and the work. If the work turns clockwise when viewed from the front, Fig. 9, the final helical surface will then be cut on the engaged tooth side of the upper zone of engagement during the infeed, being completed when full depth is attained. The feed is then reversed and outfeed proceeds at the same rate as the infeed. Meanwhile the work turns at the same rate and in the same direction as before. During the outfeed the final helical surface is cut on the engaged side of the lower zone of engagement.

On completion of this feed cycle the opposite sides of spaced teeth will have been completed and the work is indexed for the next cycle while the cutter is clear.

This cutting process will be clearly understood by referring to Figs.

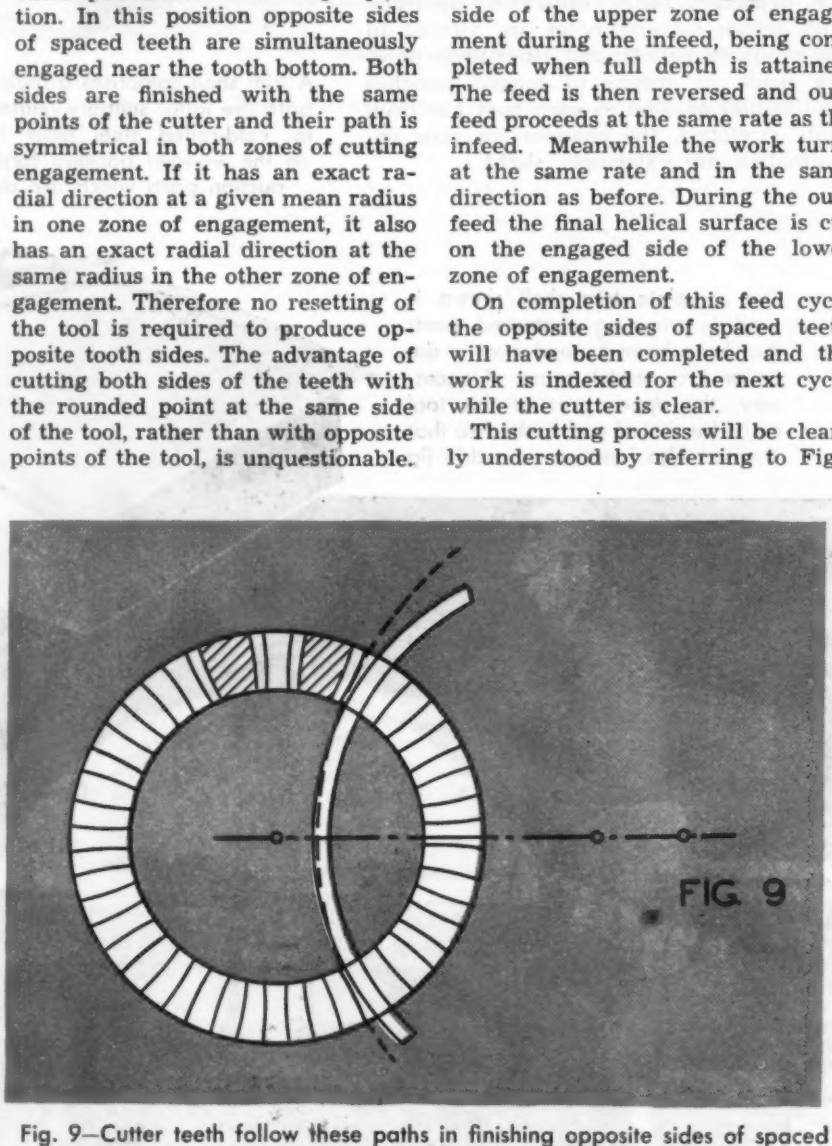


Fig. 9—Cutter teeth follow these paths in finishing opposite sides of spaced teeth in one member of an overload clutch. The mating member is cut with the rounded blade points at the outside of the cutter as shown by the dash lines and contains concave teeth

11 and 12 where Fig. 11 is a cross-section of the upper tooth space engaged by the cutter, looking from the outside in. The left side of the tooth space is cut during the infeed where the cutting profile moves from the dash-line position at the left to the full-depth position shown in full lines. During the backfeed the cutting profile moves to and past the dash-line position at the right, whereby a surface is described which is removed in the other cutting engagement.

In the lower tooth space shown in Fig. 12 the cutting profile moves in from the dash-line position at the left to the full-depth position shown in full lines and thence to and past the dash-line position at the right. The final helical tooth side at the right is cut during the outfeed. Thus it is evident that both sides of the teeth can be properly cut in one operation with a single cutter, and with speed and accuracy.

The other clutch member of the pair is cut with the rounded blade point at the outside of the cutter and contains teeth which are concave lengthwise and have helical sides. The cutting process follows the method used for the first clutch member.

Provides Moderate Ease-off

The circle described by the finishing points at the outside of the cutter is shown in dash lines in Fig. 9 in full-depth position, where simultaneous contact is made with the root portions of opposite sides of spaced teeth. This circle is larger than the circle of finishing points of the other cutter, and its center is further away from the clutch axis. This provides tooth profiles which are concave lengthwise and less curved than the convex profiles of the mating teeth. Thus the pressure of contacting teeth tends to drop down towards the tooth ends, resulting in a moderate and desirable ease-off of the tooth ends without effort.

The described motions are available on standard spiral bevel and hypoid generators, supplemented by a feed cam for infeed and subsequent outfeed at the same rate.

The sawtooth clutch, indicated in Figs. 13 to 16, is another type which can be advantageously produced by the face mill process. Its teeth contain a straight driving side and a helical releasing side. The helical side is of straight radial shape, in sections perpendicular to the clutch axis and slightly eased off at the tooth ends. It is desirable to generate

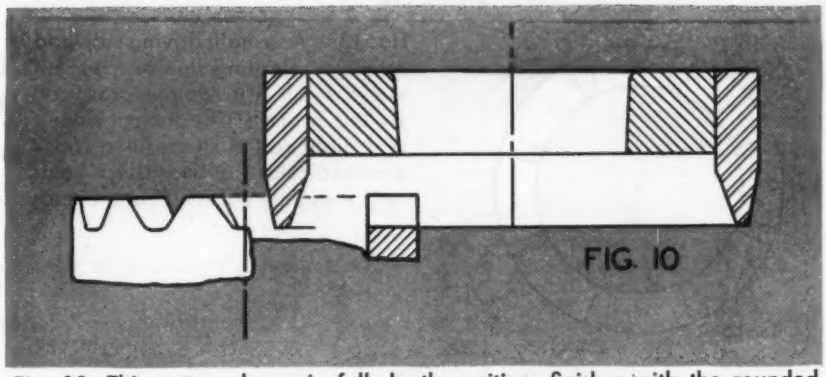


Fig. 10—This cutter, shown in full depth position, finishes with the rounded points of the inside edges, producing slightly convex tooth sides

it with the side of the cutter profile rather than with its point so that the finish may be improved with a minimum number of cuts.

A surface of revolution, of convex profile in an axial section and convex lengthwise shape, can be determined to contact along a line with a given helical surface and embodied by a rotating cutter. The simplest surface is a sphere and the surface generated by a sphere on the work in proportional feed motions along and about the work axis is bound to be a helical surface. And, provided that the sphere radius is determined accordingly it will be the desired helical surface.

When the sphere portion and the helical tooth side are in contact at mean point *P* in Figs. 13 and 14, the sphere center is bound to be located on the surface normal at this point. A sphere which is too small will touch the desired helical surface only at the point *P*. A sphere which is too large will intersect the desired helical surface while the sphere of the right size will be tangent to the helical surface along a line.

A helical surface with a truly radial shape and showing lines of constant elevation from its tangent plane at *P* is shown topographically in Fig. 16. This can be considered as a very great enlargement of the surface area immediately around point *P*. The radial line and the helix passing through *P* are shown as a horizontal straight line and a vertical straight line respectively. The full lines closest to *P* represent a small constant elevation of the helical surface over the tangent plane. The next lines represent twice as much elevation and the following lines three, four, five and six times as much as the first lines.

Lines of constant elevation of the sphere which contacts the helical surface along a line, and which will be called curvature spheres, are indicated in Fig. 16 by dash lines. The smallest circle indicates the same elevation from the tangent plane as the full lines closest to point *P* and should be tangent to them. The other circles indicate progressively larger elevations and should be tangent to the corresponding elevation lines of the helical surface. The connecting line of all the points of tangency is

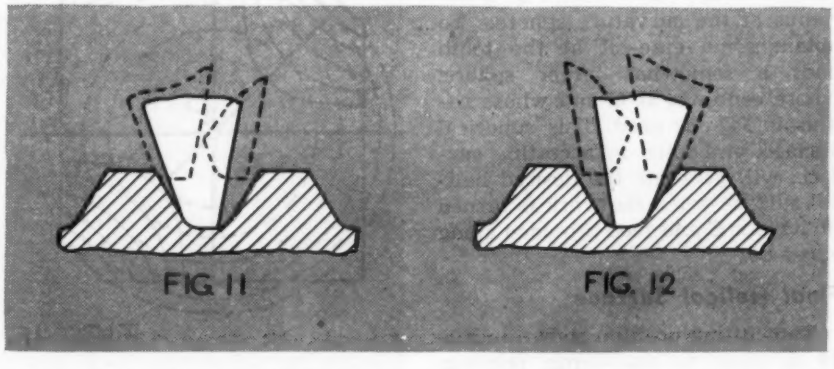


Fig. 11—The left side of the tooth space is cut during the infeed and full depth position is indicated by the full lines. Fig. 12—The cutting profile moves in from the left to full-depth position and then out to and beyond position at the right. Final helical tooth side at the right is cut during the outfeed

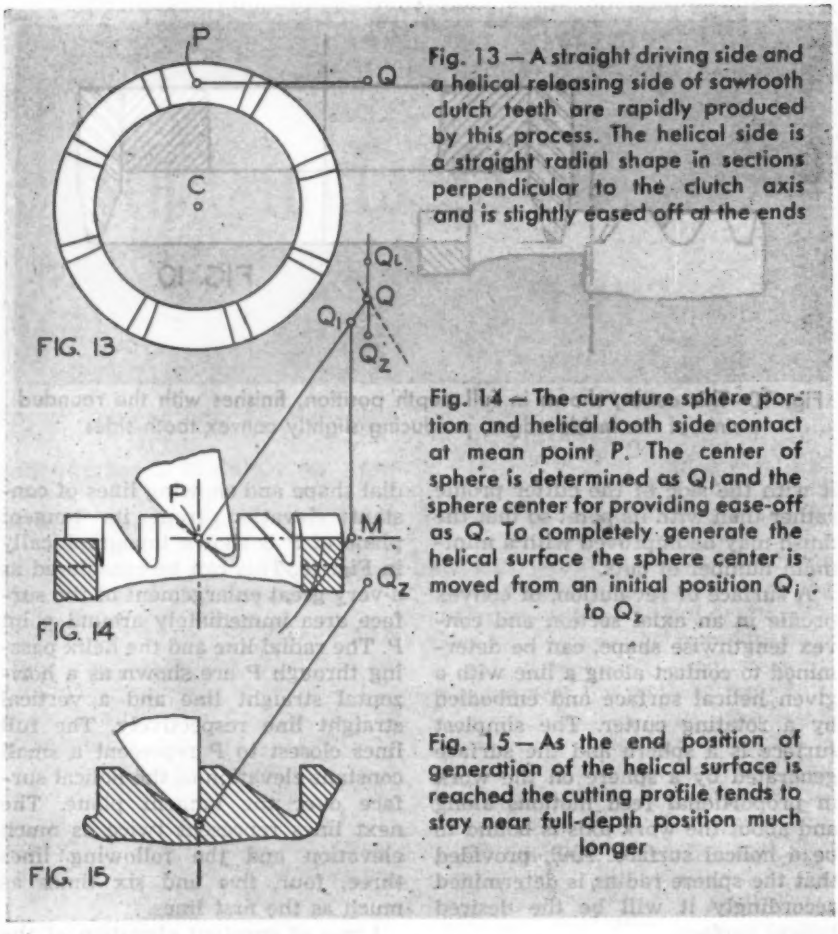


Fig. 13 — A straight driving side and a helical releasing side of sawtooth clutch teeth are rapidly produced by this process. The helical side is a straight radial shape in sections perpendicular to the clutch axis and is slightly eased off at the ends

Fig. 14 — The curvature sphere portion and helical tooth side contact at mean point *P*. The center of sphere is determined as Q_1 and the sphere center for providing ease-off as *Q*. To completely generate the helical surface the sphere center is moved from an initial position Q_1 to Q_2

Fig. 15 — As the end position of generation of the helical surface is reached the cutting profile tends to stay near full-depth position much longer

the line of contact between the helical surface and the curvature sphere.

It can be demonstrated that the center of the curvature sphere is at Q_1 in Fig. 14, determined by drawing a line parallel to normal *PQ* at a distance from *P* equal to the radial distance *PC*. This line intersects the plane *PM* at point *M*. Plane *PM* contains point *P* and is perpendicular to the clutch axis. The center of the curvature sphere Q_1 lies at the intersection of the surface normal *PQ* with line MQ_1, drawn through *M* parallel to the clutch axis. PQ_1 is the radius of the curvature sphere. To obtain some ease-off at the tooth ends a somewhat larger sphere, whose center is at *Q* and whose radius is PQ_1, is used. This spherical surface, embodied as a cutting surface, will generate the desired helical surface when the work is turned on its axis *C* and feed provided along this axis.

Final Helical Surface

The cutting position shown in Fig. 14 is close to full-depth position. However, the helical surface is far from being fully generated when the infeed has progressed to this position. It contacts with the cutter surface in an oblique line which passes through mean point *P*. Only the surface from this line up towards the tooth tops is generated and made a helical surface. To completely generate the helical surface it is necessary to move the sphere center from initial position Q_1 to position Q_2 in Fig. 14.

Here an additional motion about an axis which passes through the sphere center is introduced to avoid prematurely hitting the tooth bottom. This added motion does not disturb the shape of the generated surface for the location of the sphere itself remains unaffected. It only displaces the sphere portion described by the cutter on the sphere itself.

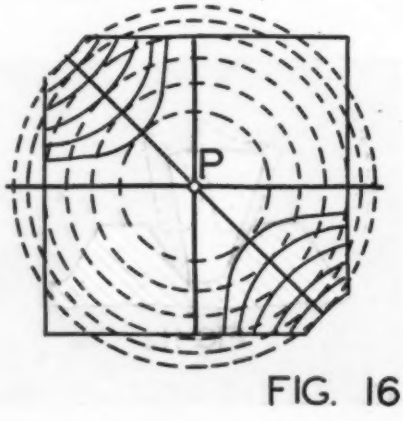


Fig. 16—Lines of constant elevation from the tangent plane at *P* are indicated in this topographical sketch of a helical surface of true radial shape, progressively noted

The additional motion may be about an axis perpendicular to the drawing plane of Fig. 14 and passing through the sphere center *Q*. During the infeed it is in a clockwise direction and tends to move the cutting profile away from the tooth bottom in an opposite direction to the infeed. Thus the cutting profile tends to remain at full depth much longer while the sphere center moves from *Q* to Q_2. The end position of the generation is shown in Fig. 15. The helical tooth side has been completely generated and the straight driving side is being cut. The cutter and work are then moved apart and after the work has been indexed they are brought back to a new starting position.

The rotary cutter may be of face mill type and have an axis passing through *Q*, as shown by the dash lines in Fig. 14. In this case the straight driving side will be cut with the inside cutting edges so that it is convex lengthwise and has eased-off tooth ends. The axis of the additional turning motion does not have to be perpendicular to the drawing plane and may be inclined at other than a right angle. This motion may be carried out on a standard spiral bevel and hypoid generator of specified design to provide sufficient range of adjustment. In this way the helical sides are generated somewhat like gear teeth, and a fine finish is readily obtained. Many types of clutches and couplings can be cut or ground by this method, and provided with either a positive or a zero pressure angle.

Correction

A CONTROLLED SOLUTION of nitric acid and water for removing copper-brazed carbide cutting tips from tool shanks was erroneously given as 8 to 9 percent nitric acid in a brief article appearing in a recent issue. The correct solution is 80 to 90 percent nitric acid and 10 to 20 percent water, maintaining the temperature of the solution between 176 and 194 F. The mistake was caused by a typographical error and was quickly noted by the authors, R. G. Maurer and E. F. Davis of the Westinghouse Electric Corporation.

Practical Ideas

HAVE YOU A PRACTICAL IDEA?... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Brake Drums of Airplane Wheels Ground While Assembled to Hub

C. M. HUNTLEY

The usual method for grinding brake drums for airplane wheels had been to take them out of the wheel hubs, face and then press them in place again. While the drums were concentric after grinding, pressing back into the hub distorted them.

An improved method consisted of supporting the drum and wheel assembly on a dummy axle and placing the assembly between centers. The dummy axle passes through the roller bearings regularly used in the wheel assembly. With this set-up, the axle is stationary. Thus, the wheel and brake assembly rotates about its own center and errors that might originate from the dummy axle are eliminated.

The total time consumed in setting-up to grind in this way was less than required to remove and replace the drums in the previous method, and a better job resulted.

Brake drums, ground while mounted on a stationary axle, rotate on their own roller bearings and run true to the wheel center

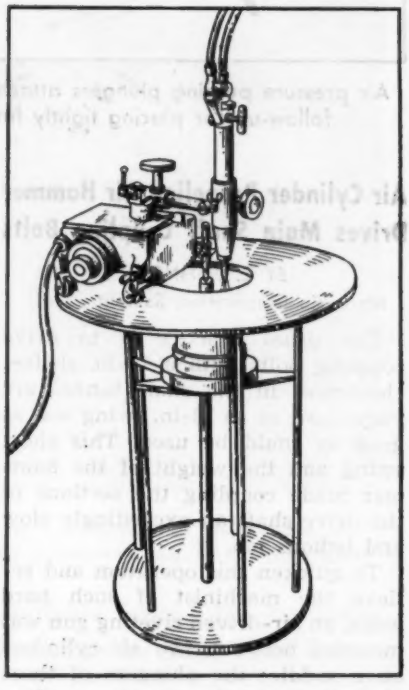
Large Washers Are Quickly Cut on a Burning Table

BY S. J. MILAZZO

Delta Shipbuilding Company, Incorporated

Large washers can be cut economically on a table made from scrap steel.

The circular top is supported at a convenient height by legs made from rods welded to the base and top. The top is large enough in diameter to form a track upon which the burning machine can travel about a pivot. A hole in the top permits the torch to reach through and burn the washer supported below the table top level. Braces between the legs make a rigid support for the plate to be burned. In the center of the table is a plug about which the burning machine rotates and on which the washers are centered.



Large washers are burned economically and rapidly to size by the use of a large round top table upon which the burning machine travels about a fixed center

Because the braces between the legs are some distance below the table top, fire brick can be used to build the washer blank to the correct height for the torch.

A pivot attached to the burning machine centers on the plug at the center of the table. Variation in diameters is made by adjusting the burning torch on the machine. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Air pressure pushing plungers attached to a riveting gun makes a positive follow-up for placing tightly fitting bolts in drive shaft couplings

Air Cylinder Propelled Air Hammer Drives Main Shaft Coupling Bolts

BY E. JOHNSON
Marinship Corporation, Sausalito, Calif.

The usual practice is to drive coupling bolts with a 16-lb. sledge; clearances in the shaft tunnel are very close, so an 18-in. swing was as good as could be used. This short swing and the weight of the hammer made coupling the sections of the drive shaft an exceedingly slow and tedious job.

To quicken this operation and relieve the machinist of such hard work, an air-driven riveting gun was mounted between two air cylinders on a saddle; the plungers of these air cylinders follow up the coupling bolts as the air gun drives them into the coupling. To hold this unit securely to the shaft, there is a band for tightening the saddle to the shaft to prevent movement while in operation. With the plungers operating at an air pressure of 100 lb. per sq. in., the pressure against the driving gun is 4000 pounds. Another advantage is that the saddle can be moved around the shaft for each bolt position.

The previous method required four machinists to swing the sledge and four riggers to turn the shaft for a period of eight or nine hours, and the bolts were frequently damaged by the pounding they received. With the pneumatic ram and riveting gun, all the bolts can be in position in from one and one-half to two hours, only two machinists being required. Because the motor does not have to be turned, the time necessary to clean the armature is also saved. The time saved amounts to about 100 man-hours per hull and there is no damage to material. Thrust clearance and other work can be done at more convenient times after all other operations have been completed. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Dial Indicator on Carriage Makes Micrometer Stop Gage on Lathe

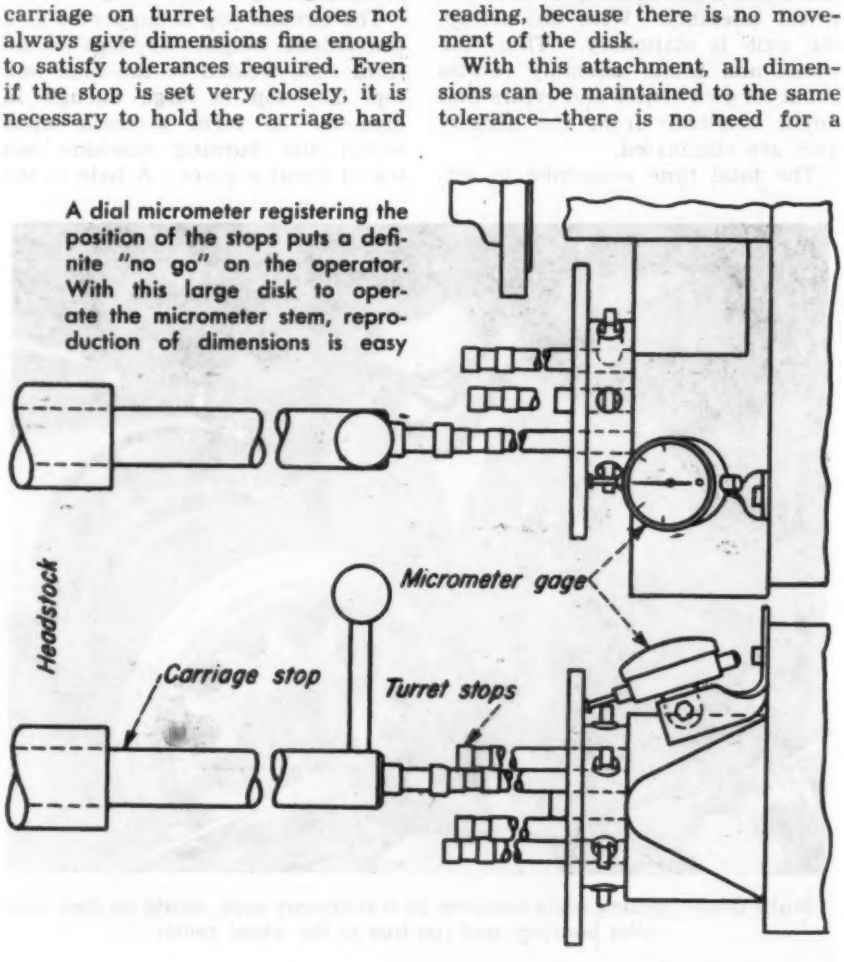
BY GORDON CHAPMAN
Wilcox-Rich Division,
Eaton Manufacturing Company

The regular indexing stop for the carriage on turret lathes does not always give dimensions fine enough to satisfy tolerances required. Even if the stop is set very closely, it is necessary to hold the carriage hard against the stop for several revolutions to shave off the last few thousandths of an inch of metal. But this practice is never too definite, because the operator can bear down heavy or light on the carriage feed and vary the dimension considerably, there is nothing to indicate a definite stop limit.

To provide a positive indication of just how far the machinist can go and still be within the limits, a large diameter collar is fastened to the carriage stop. A dial indicator is also attached to the carriage. As the feed progresses, the carriage moves toward the cut until the carriage stop strikes the fixed stop on the bed. As the carriage continues to move, the large collar touches the sensitive micrometer dial button and compresses it until it comes to zero or some other predetermined reading. As long as every cut comes to this same dial reading, all parts made with this set-up will be the same, even though all six tools are in use, provided these are set correctly. The carriage stop comes into play only when the stops are in contact. Otherwise, there is no dial reading, because there is no movement of the disk.

With this attachment, all dimensions can be maintained to the same tolerance—there is no need for a

A dial micrometer registering the position of the stops puts a definite "no go" on the operator. With this large disk to operate the micrometer stem, reproduction of dimensions is easy



heavy feed at the end of each cut; when the micrometer registers zero, all machining should stop at that point.

The result of this attachment is uniformity of dimensions, a saving in labor and material through reducing loss by avoiding scrap. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Collet Block Releases Expensive Precision Machine Tools

BY JOSEPH I. VITEK
Navy Yard, Washington, D.C.

Sometimes, accurate machine tools and indexing mechanisms are used for relatively simple functions which, with an inexpensive fixture, could be performed on a less precise machine. Where quantities are large and the demand for accuracy is not great, those parts with wide tolerances should not be made upon machinery capable of manufacturing to very close limits. True, some improvising will be necessary, but much can be accomplished without too much outlay of material, money or time.

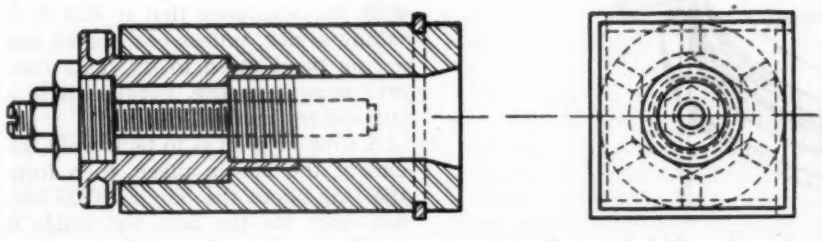
To free expensive accessories for better work, a collet block was made which could be used on a milling machine, drill press, surface grinder, shaper or any other machine. Because of its versatility, many plain operations can be done on work held in this device.

Depending upon the type of work performed, and the number of positions, the section of the block can be rectangular, hexagonal, or other shape.

The block is bored to the taper of the collet, and drilled the rest of the length. A key is located in the tapered section to prevent the collet from rotating during operation. Tightening the collet is accomplished by turning a draw-tube which shoulders against the counterbored hole in the block but threads over the end of the collet. In the outboard end of the drawtube is threaded a short lock bolt which carries a long adjusting screw for fixing the position of the part to be machined. A nut holds this screw against movement.

The advantage of using collets lies in the fact that round, square, flat and hexagonal bars can be worked upon simply by having collets of the proper size and correct interior shape. For very long pieces, the stop-screw and its accessories are removed and a tubular extension, with stops, substituted.

Fixtures of this type are useful and economical. *Suggestion Submitted Under the Navy Employees' Suggestion Program.*



Collets fitting into blocks equipped with draw-tube and stop find many applications in manufacturing operations

Shaft taper gage checks machined ends for uniformity of dimensions. Adjustments of the side bars and top stops determine the taper accurately

Adjustable Taper Gage Duplicates Dimensions for Exact Shaft Fits

BY WILLIAM L. SMITH
Puget Sound Navy Yard

Machining tapers on shafts to match exactly a corresponding hub, especially where interchangeability is necessary, many trials may be required before success is attained. If the plug fits the hub bore correctly, it is possible to make an external gage which can be adjusted to the plug or vice versa.

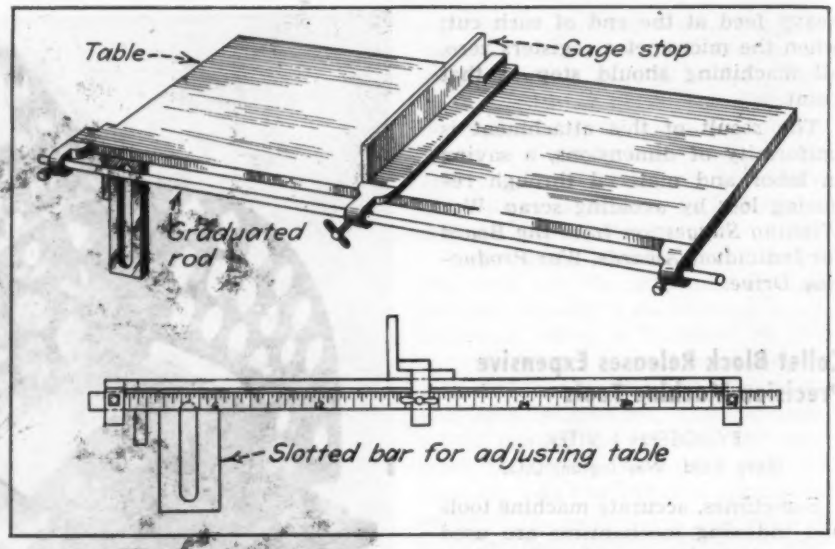
An external gage to measure the taper of shafts consists of frames rigidly parallel, adjustable stops at the middle point of the inner part of the frame, and adjustable gage bars on each side.

Where a standard taper has been adopted, it is advantageous to machine the gage bars to this taper so that, when the gage is set, the outer edges of these bars are parallel. To accommodate reasonable ranges of diameter, these bars are adjusted by thumbscrews attached to the frame at each corner. These gages are limited in their range, so various sizes are required.

Duplication of tapers can be done

by placing the gage on a plug, or sample shaft, then making necessary adjustments. After these arrangements have been made, the gage is placed over the machine end of the shaft and the inequalities reduced until the correct taper is obtained.

For large shafts, two men, without a crane, can handle the gage easily and check the taper of every shaft so that uniformity may be obtained. *Suggestion Submitted under the Navy Employees' Suggestion Program.*



This gage can be quickly set to shear desired lengths of material and reduces the layout time by about 75 percent

End facing and center drilling are accomplished by the use of a tool in which a ball bearing guides the bar while the cutter and center drill operate to remove metal

Centering and Facing Tool for Bench Lathe Production

BY NORRY M. MEADE
International Business Machines Corp.

For finishing the ends of rods with accuracy, where the rod projects some distance from the collet, support is required either from the tailstock center or some form of box tool which will hold the rod in position during the cut.

A tool has been made which will hold the rod in position while a facing cut is taken and a center drill is used on the end of the shaft. The tool consists of a shank to be held in the tailstock or turret, a forming tool held in the head to remove metal, a center drill to locate a center hole, while a shielded ball bearing of correct bore guides the rod and centers it during the cut.

Pressure of the cut causes the inner race of the ball bearing to rotate and not scar the workpiece

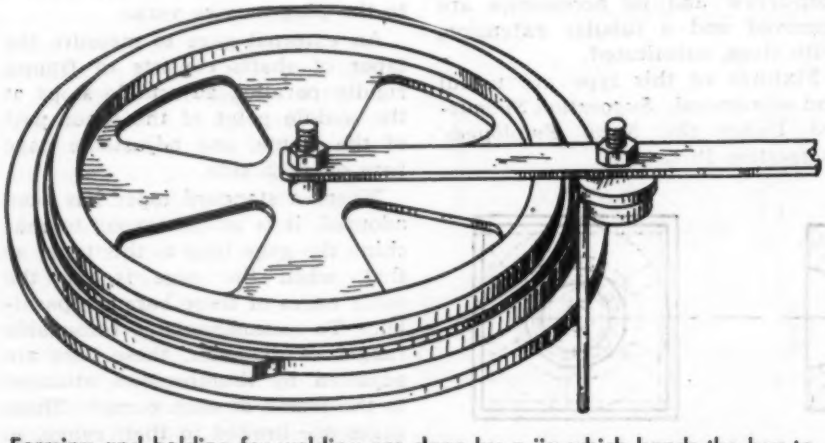
The assembly operates so successfully that it shows a saving of 50 percent over the previous method. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Gage for Small Shear Eliminates Marking of Bars

BY W. D. BRUCE
Lake Washington Shipyards

A graduated rod mounted along the table of a shear saves time in laying out flat bars for cutting and gives more accurate results than is usual with the hand method.

A graduated rod is mounted along the front edge of the table. A gage stop which slides along the table top is fitted with two wing screws, one to lock the stop to the graduated rod and one to lock the rear of the stop to the table. The stop can be easily set to cut any desired length of bar. *War Winning Suggestion Submitted under the Navy Employees' Suggestion Program.*



Forming and holding for welding are done by a jig which bends the bar to fit the contour as a roller is moved along the surfaces

Forming Jig Holds Bar Stock in Position for Welding

BY M. D. KISER
St. Johns River Shipbuilding Company

To form a ring for an escape hatch, then put it in place for welding with the assurance that it will fit is taking a risk, unless each hatch has a ring hand fitted to it. This runs into much expense, because it is a cut and try method.

A simpler plan is to tack weld the end of the bar in place, then form the ring about the hatch. This idea not only fits the bar, but holds it rigidly in place for welding.

The jig body fits the inside of the

hatch closely and a lever is pivoted at center of the jig. Attached to the lever is a roller which bears against the outside edge of the hatch. This roller has a smaller diameter capable of accommodating the thickness of the ring to be welded to the hatch.

After the bar has been tack welded at the end, movement of the roller on the lever bends the bar and holds it against the outside of the hatch; the bar is bent ahead of the welding until the process is completed.

This method saves a great amount of fitting and the results in a much more satisfactory finish. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Cams Replaced on Shafts Reamed for Taper Pins

BY MARTIN H. BALL

It is sometimes necessary to replace cams on shafts which are reamed for taper pins. Because of the impossibility of transferring the location of the hole in the shaft to a new cam, it is more convenient to drill and ream a new hole, thereby weakening the shaft, or to replace the shaft entirely.

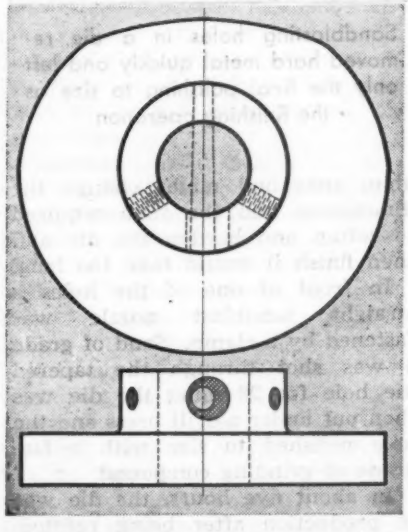
There are occasions when replacement involves some inconvenience and much expense, in which case the old hole must be used. This troublesome problem can be overcome by drilling a hole radially through one side of the hub, the diameter being about twice the size of the large end of the taper pin.

The procedure is to drill the hub in the approximate location of the taper pin, then drill and tap two holes about 60 deg. on either side of the large hole. The reason for these tapped holes is to have three equidistant bearing points on the shaft, if the bore is oversize, thus insuring the best condition for locating the cam.

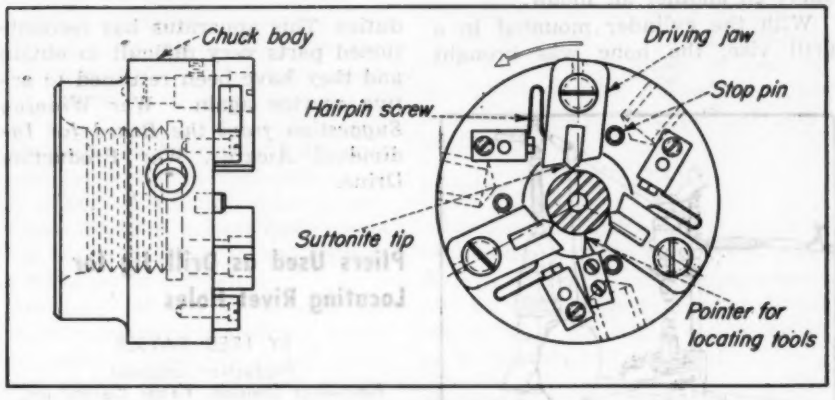
After the cam has been correctly placed on the shaft, with the lobes in time, the setscrews can be permanently seated. With a drill of a size to fit the small end of the hole in the shaft, the location of the taper pin hole is spotted on the inside of the bore after which a drill suitable for the small end of the pin is used to complete the hole. A taper pin reamer is run through the small hole in the hub with the idea of resurfacing the shaft and one side of the cam hub at the same time.

A taper pin is driven through the shaft and one side of the hub, but the large diameter end of the taper pin should be flush or project beyond the outside diameter of the hub.

The space between the taper pin and the hole in the hub is filled with melted hard solder, after which the pin is given a sharp blow with a hammer to seat it firmly. If the setscrews are in the way, they can be removed.



After the taper pin is in place, the cavity in the hub is filled with solder



Hardened points on the jaws of this chuck drive the work when mounted between centers in a lathe and eliminate the use of a driving dog

Automatic Chuck Centers Rifle Barrels and Eliminates Dogs

BY LAWRENCE FITZGERALD AND JASPER SALERNO

Winchester Repeating Arms Company

The automatic chuck shown in the drawing was designed to hold Garand rifle barrels while turning. By eliminating the use of dogs it saves the time required to put the driving dog on each barrel before turning and to remove it after the operation.

The chuck consists of a body on which three driving jaws are held by shoulder screws. These jaws are held by flat springs against stop pins. Each driving jaw has a point on which is welded a Suttonite tip.

The barrel is placed in the chuck with a slight rotary motion counterclockwise. This opens the driving jaws against the spring pressure. The tailstock center is then run into place and the power started. The turning action of the tool causes the driving jaws to bite into the barrel, causing the jaws to rotate clockwise relative to the chuck body until they strike the stop pins. The jaws then drive the barrel against the tool.

The length of the jaws is not too exacting, but they must be of fairly uniform length to maintain equal driving action. A hard and tough edge must be maintained on the jaws where they bite into the barrel. The pressure between the barrel and the jaws is so great that soft steel will upset too easily and not grip the metal.

A pointer is used to locate the multiple tools on center. A master barrel is used with a line drawn from end to end. When this barrel is mounted in the lathe with the pointer on the line, and with corresponding lines on the chuck body and spindle bearing lined up, tools can be placed with their cutting edges to the line on the barrel.

Use of this chuck increased production from 52 to 71 barrels an hour per operator. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

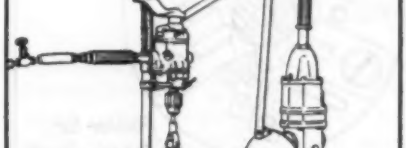
Damaged Pneumatic Tool Cylinders Salvaged by Honing

BY WILLIAM THOMPSON
Walsh-Kaiser Co., Inc., Providence, R. I.

Resurfacing cylinders by hand, after they have been in service for a long while, is a tedious operation, and there is no assurance that the cylinders will be accurate.

A convenient rigging for rotating the hone as well as oscillating it was contrived by mounting an air drill on a vertical column so that it could be moved vertically by a lever. This lever was reciprocated by a connecting rod attached to a crank, which operated through a speed reducer on another air motor.

With the cylinder mounted in a drill vise, the hone was brought down to the correct position, then the air was turned on for both motors. Rotation and reciprocation went on at the same time. Once set in motion, no attention was necessary, so the worker could perform other duties. This apparatus has reconditioned parts very difficult to obtain and they have been returned to active service again. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Reclaiming cylinders with a hone rotated and reciprocated by air motors has saved many thousands of dollars a year

★

War - Winning Suggestions

appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive and the Navy Board of Awards to Civil Employees. They are freely offered to industry as an aid to war production.

★

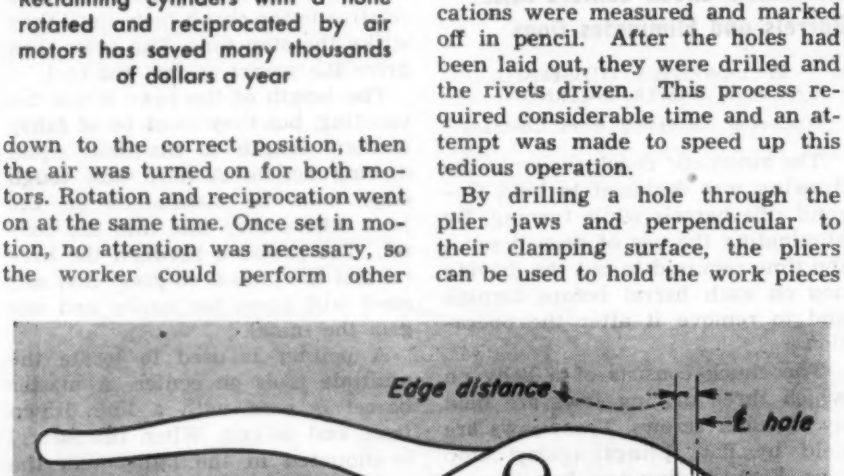
Pliers Used as Drill Jig for Locating Rivet Holes

BY FRED RAYSER
Production Engineer
Fleetwings Division, Kaiser Cargo, Inc.

To assemble the rib to a spar has been a case of spotwelding in place. Then the rib was held to the spar with pliers while the rivet hole locations were measured and marked off in pencil. After the holes had been laid out, they were drilled and the rivets driven. This process required considerable time and an attempt was made to speed up this tedious operation.

By drilling a hole through the plier jaws and perpendicular to their clamping surface, the pliers can be used to hold the work pieces together and serve as a drill jig at the same time.

This idea, developed by Cono Abbatemarco, eliminated measuring and laying out the holes and substituted a positive method for locating them in the assembly.



Rivet holes are located and drilled by the use of a pair of pliers which have a hole drilled through the jaws at the correct edge distance

Sandblasting Holes Avoids Expensive Die Alterations

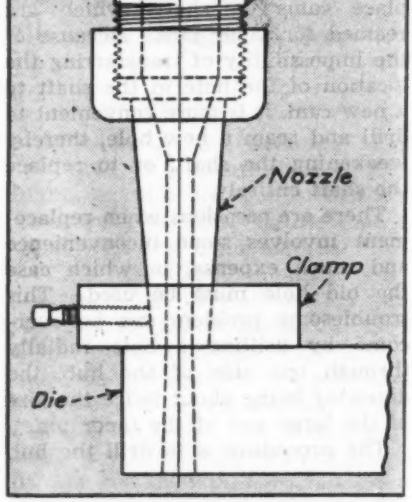
BY CARL W. RIESE
Maintenance Superintendent,
The Quirk Company

A hard tool-steel die had to be reworked, due to engineering alterations. Some of the holes had to be enlarged as much as 0.060 in. in diameter.

A diamond drill was not available; annealing might change the dimensions and the time required to soften and harden the die and then finish it would take too long.

In front of one of the holes a straight sandblast nozzle was fastened by a clamp. Sand of grade 4 was shot through the tapered die hole for 28 min.; the die was then put under a drill press and the hole polished to size with a fine grade of grinding compound.

In about five hours, the die was in production after being refitted, representing a great saving in material, time and money.



Sandblasting holes in a die removed hard metal quickly and left only the final polishing to size as the finishing operation

Master Disks

COMMERCIAL STANDARDS (EMERGENCY) CS(E) 124-45

Foreword

The War Production Board requested the aid of the National Bureau of Standards in establishing commercial standards for several categories of precision devices, including toolroom specialties. One of these projects was a commercial standard for master disks of American Gage Design Committee styles. After a conference of gage manufacturers and users, a draft of the proposed standard was circulated to industry for approval. It was announced that the standard given below would become effective for production from Sept. 15, 1945.

Purpose and Scope

The purpose of this commercial standard is to provide minimum essential requirements for master disks described herein, as a basis for better understanding between sellers and buyers, and as a basis for fair competition and identification of master disks conforming thereto. This standard covers the major essential requirements for master disks (American Gage Design) from above 0.105 in. to and including 8.010 in.

General Requirements

For the purpose of this standard, the following definitions apply:

Material—Tool steel means a high quality electric furnace alloy steel, alloy tool steel, or carbon tool steel free from all imperfections which might mar the finished surface of the product.

Seasoning—Shall include an appropriate treatment for the artificial aging of tool steel to prevent distortion or dimensional change after the surfaces have been finished.

Finish — The following designations for surface finishes apply: **Ground**—All finish-ground surfaces shall be smooth and free from objectionable chatter, tool marks, irregular wheel marks, burning or scratches; **Lapped**—A lapped surface shall be lapped to give a uniform, truly cylindrical, smooth surface free from all traces of machining or grinding and shall show no evidence of objectionable scratching.

Detail Requirements

Design — Master disks shall be made according to the designs adopted by the American Gage Design Committee and promulgated in latest revision of Gage Blanks, Commercial Standard CS8. Master disks shall be ground and lapped.

Material—Master disks shall be tool steel, hardened, drawn and seasoned, or material of equal or greater resistance to wear.

Styles—The styles of American Gage Design master disks are given and illustrated in latest revision of CS8.

Hardness—Master disks shall have a minimum Rockwell hardness of C63 or equivalent surface hardness.

Sizes—Sizes of master disks range from above 0.105 in. to and including 8.010 in. in diameter.

Accuracy—Master disks shall be ground and lapped to specified diameter (nominal size) within the tolerances of the class specified in the accompanying table. These tolerances shall apply to all diameters between points 1/16 in. in from the ends of the full working surface. Total variations in roundness and/or taper shall not exceed one-half the size tolerance.

Methods of Test

Cylindrical trueness (roundness and taper) shall be tested in a comparator of suitable amplification. Roundness may be tested in a multiple contact anvil such as a V-block. Any equivalent method may be used.

Trueness to size shall be determined at 68 F. by means of a measuring machine or a vertical or horizontal comparator of suitable amplification used with gage blocks of suitable accuracy and with a 1-lb. measuring load, except that for nominal diameters above 4.510 in. a 2½-lb. load may be used. In making the above measurements the measuring accuracy of the instruments used should be adequate in relation to specified disk tolerances. An equivalent measuring method may be used.

Packing

Each master disk shall be supplied in a suitable, protective case or box. As a protection against climatic conditions, each master disk shall be coated with a suitable noncorrosive oil or grease, and wrapped.

Marking

Size and class designation. Where practicable, each master disk shall have legibly and permanently marked upon it in characters not less than 0.025 in. high the nominal size and class (XX, X, or Y) of the disk.

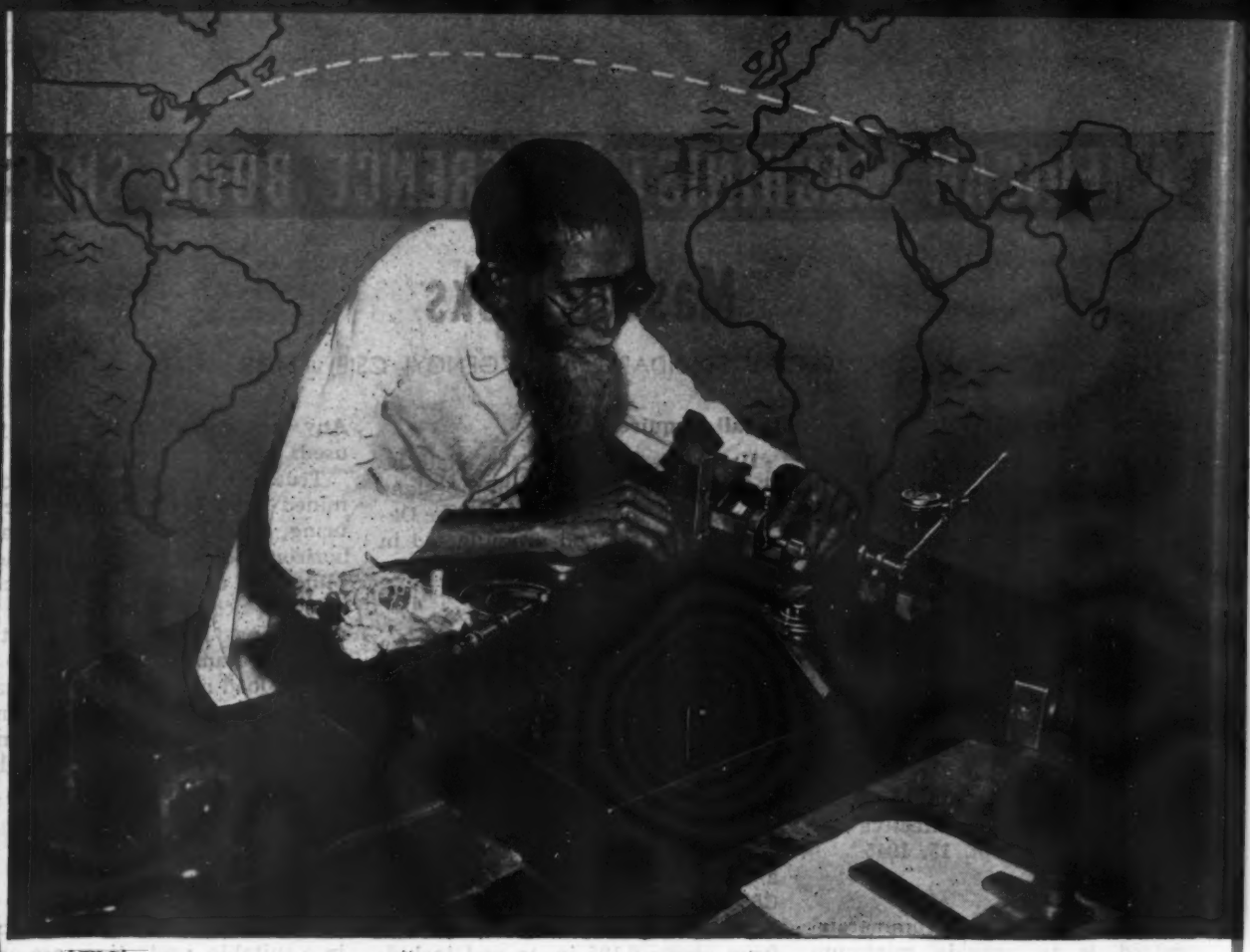
Manufacturer's name or trade mark. Where practicable, each master disk shall have legibly and permanently marked upon it in characters not less than 0.025 in. high, the manufacturer's name or trade mark.

TOLERANCE ON DIAMETER FOR MASTER DISKS
(Classes XX, X, Y, gage makers' tolerances)

SIZES		TOTAL TOLERANCE[1] ON NOMINAL SIZE		
ABOVE	UP TO AND INCLUDING	CLASS XX	CLASS X	CLASS Y
in.	in	in.	in.	in.
0.105	0.825	0.00002	0.00004	0.00007
0.825	1.510	0.00003	0.00006	0.00009
1.510	2.510	0.00004	0.00008	0.00012
2.510	4.510	0.00005	0.00010	0.00015
4.510	6.510	0.000065	0.00013	0.00019
6.510	8.010	0.00008	0.00016	0.00024

[1]Tolerance may be taken in plus direction, minus direction, or split half above and half below nominal size, as specified by purchaser.

STARRETT TOOLS



OWI Photo

STARRETTS went to *Mohamed*

This is Mohamed Ellahi Bukhsh, expert user of Starrett Tools at a munitions plant in India.

Mohamed and his six children who also work in Indian war plants depend upon the lasting precision and extra handiness of American precision tools — *Starrett* Tools. In the picture are Starrett Micrometers, a Starrett V Block, Starrett Bevel Protractor and Starrett Dial Indicator Gage.

The accuracy and fine workmanship that have always distinguished Starrett Tools have added sureness and swiftness to the hands of good men and true throughout the Allied world. These are qualities to adhere to in men and in measuring tools.

Ask your mill supply distributor to make yours the tools you can trust— *Starrett* Tools.

Now, with 3 Service Stars

THE L. S. STARRETT CO. · ATHOL · MASSACHUSETTS · U. S. A.

World's Greatest Toolmakers

STARRETT

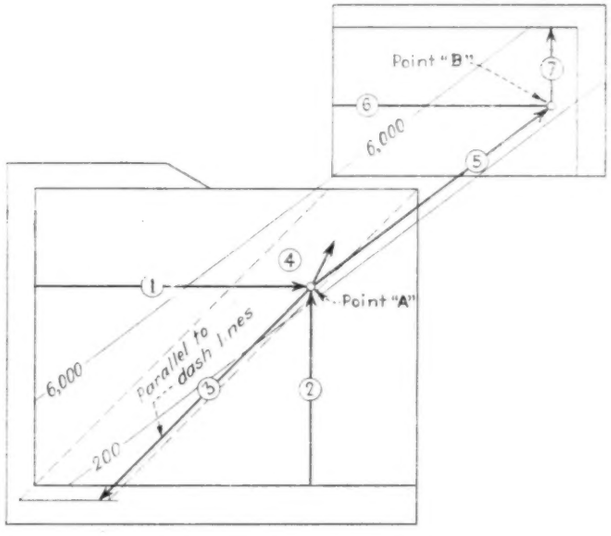
PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

AMERICAN MACHINIST REFERENCE BOOK SHEET

Deflections and Capacities of Helical-Round Bar Springs

BY NATHANIEL B. ARCHER, MECHANICAL DESIGN ENGINEER
RYAN AERONAUTICAL COMPANY

This chart is based on a torsional modulus of elasticity of 11,520,000 (for high-grade spring wire) and a fiber stress of 100,000 p.s.i., which is practically the upper limit. If some other fiber stress is used, multiply by a suitable factor. For example, if a maximum fiber stress of 50,000 p.s.i. is wanted, the factor will be 50,000/100,000, or 0.5 to convert the result given by the chart. By requiring the user to make this simple step, the chart is kept simple, which is important in spring calculation.



HOW TO USE THE CHART

Refer to the diagram above.

1. Draw a horizontal construction line 1 from the "Wire Size" scale, in this case 3/16 in.
2. Draw vertical construction line 2 from the "Pitch Diameter of Coil" scale, in this case from 1¾ in. The intersection of construction lines 1 and 2 gives point *A*.
3. Draw construction line 3 from point *A* to the "Dependability" scale, being careful to keep the construction line parallel to the dash lines on the chart.
4. Maximum deflection per coil is 0.445 in., determined by drawing construction line 4 from *A* and parallel to solid lines terminating at the scale "Maximum Deflection per Coil."
5. From point *A* draw construction line 5 to upper section of chart, being careful to maintain it parallel to sloping lines for "Total Load on Spring."
6. Assume nine active coils for spring. Draw horizontal construction line 6 from scale "Number of Active Coils," and point *B* is located at the intersection with line 5.
7. Draw construction line 7 to scale "Pounds of Force per Inch of Deflection," and obtain 36 lb. as the answer.

TURN PAGE AND OPEN FOLD TO FIND SPRING CHART ➡

On thei

Today the veterans of our European victories are sailing to final triumph in the Pacific! Meanwhile patriotic American industrial leaders are following a full-speed-ahead program to hasten peace through the Payroll Savings Plan!

From coast to coast, veteran Bond salesmen—and women—who put over the Mighty 7th, are once more mustered into service for plantwide selective re-

The Treasury Depar

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★ *This is an official U. S. Treasury advertisem*

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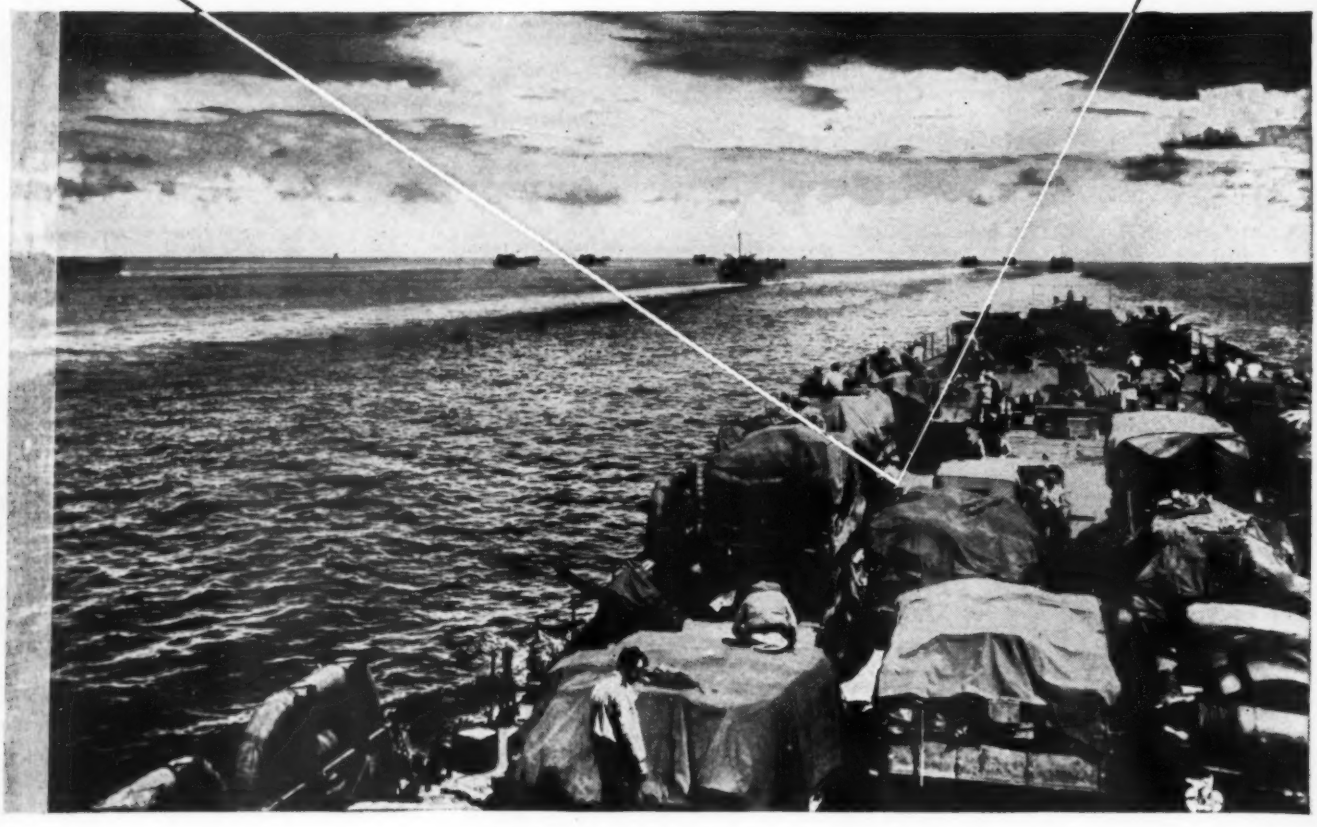
On their Way again to Win again!



Are You?

Today the veterans of our European victories are sailing to final triumph in the Pacific! Meanwhile patriotic American industrial leaders are following a full-speed-ahead program to hasten peace through the Payroll Savings Plan!

From coast to coast, veteran Bond salesmen—and women—who put over the Mighty 7th, are once more mustered into service for plantwide selective resolicitation campaigns. These special efforts to keep employee Bond buying at a maximum are directed toward two major objectives:

A To hold every new 7th War Loan subscriber on the Payroll Savings Plan books—maintaining and, wherever possible, increasing present Bond allotments.

B To convince all regular subscribers who recently stepped up their Bond buying, of the many advantages of continuing on this foresighted, extra-Bonds-for-the-future basis.

Back up our fighting men who have won one war—and will win another. Use selective resolicitation to make your Payroll Savings Plan more effective—put a tighter rein on inflationary tendencies—build peacetime prosperity.

The Treasury Department acknowledges with appreciation the publication of this message by

American Machinist

★ *This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and War Advertising Council* ★

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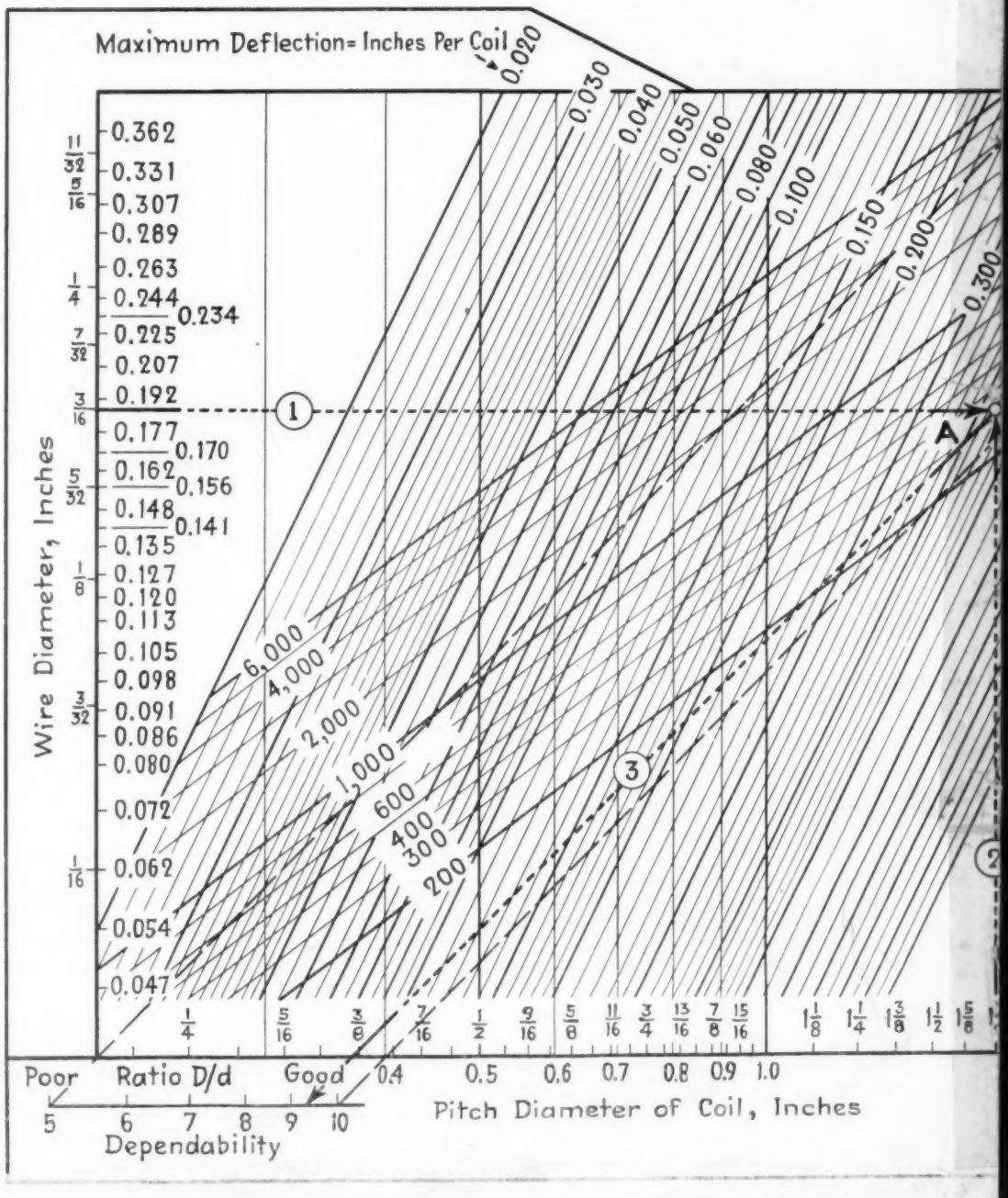
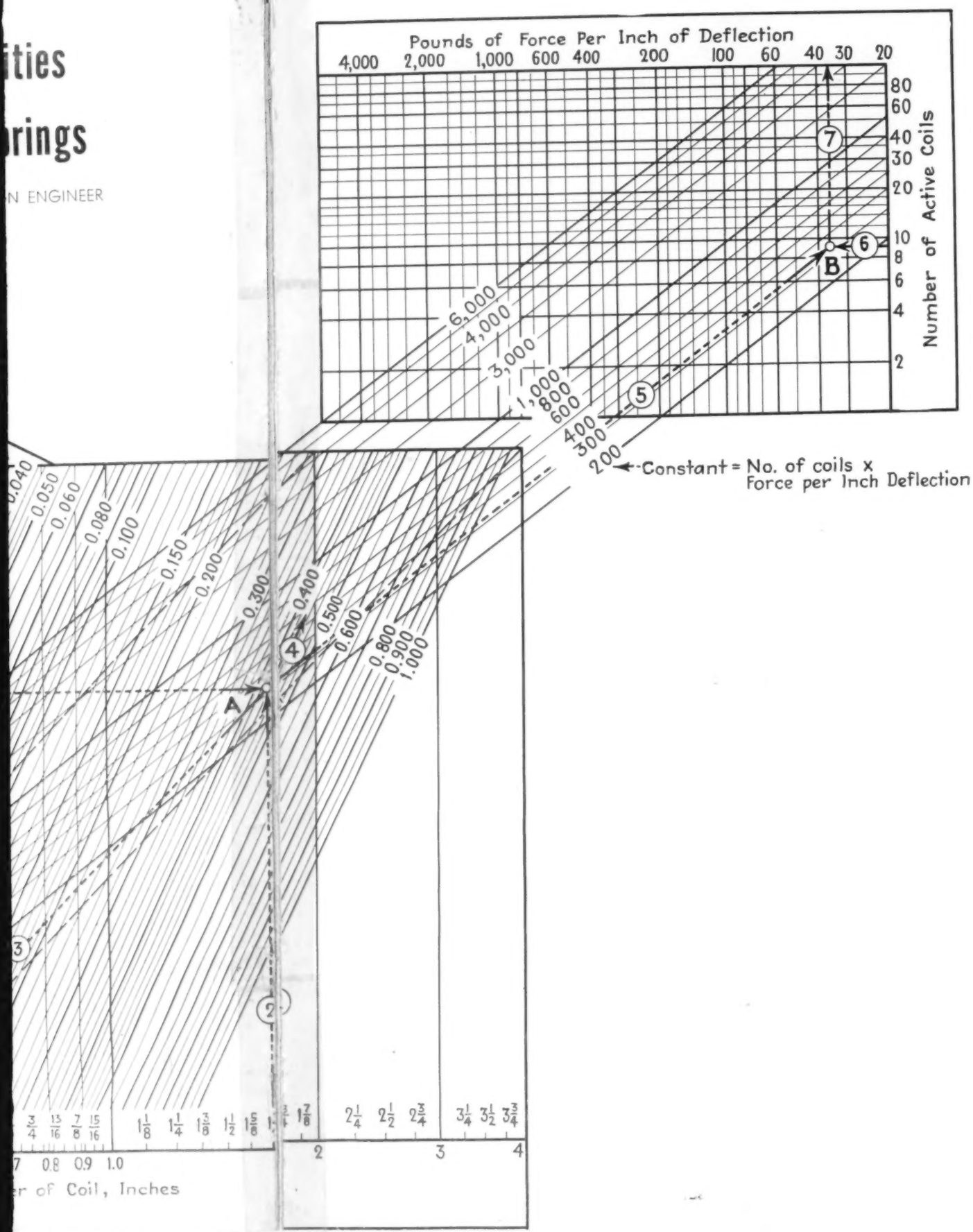
Deflections and Capacities of Helical-Round Bar Springs

BY NATHANIEL B. ARCHER, MECHANICAL DESIGN ENGINEER
RYAN AERONAUTICAL COMPANY




Pounds of Force Per Inch of Deflection
4,000
2,000
1,000
600
400
200
100
60
40
30
20
Number of Active Coils
80
60
40
30
20
10
8
6
4
2
6,000
4,000
3,000
1,000
800
600
400
300
200
Constant = No. of coils x Force per Inch Deflection
0.040
0.050
0.060
0.080
0.100
0.150
0.200
0.300
0.400
0.500
0.600
0.800
0.900
1.000
A
B
1
2
3
4
5
6
7
0.8
0.9
1.0
2
3
4
of Coil, Inches

Gaging Business

Releases of Materials

Cutbacks in war contracts are proceeding in an orderly manner and by the end of the year will be 30 percent of the March volume of war production. During July deliveries of war goods were off seven percent from the March total, which was about $5 billion. By September the drop will be 20 percent. War production by December 31 will be on a basis of approximately $40 billion a year. Cancellations already have involved some 2,000 cases each with a volume of more than $100,000 a month. Thus far each manufacturer has 'been given at least seven days' advance warning.

Actual resources released to date as a result of shrinkage in war production have been small, but by the first quarter of 1946 almost all materials will be easier. The major obstacle to reconversion is not steel, as is popularly believed, but tin which will continue in very short supply. In many cases substitutes must be found for it. Hot rolled and cold finished sheet and strip steel 18 gage and lighter is tight at the moment, but this situation is expected to improve in the fourth quarter. If five sheet mills could get 2,000 more workers, sheet output could be stepped up 80,000 tons a month, or enough to satisfy reconversion as well as war needs. Sheet users have been requested to reduce their inventories from 60 to 45 days. War Production Board has a force of 500 men in the field to see that this request is fulfilled.

WPB has plans for lifting still further later this year some of its controls. Strong criticism of industry is being voiced by WPB officials because manufacturers are seeking to hold priorities for their products so that they themselves will not be forced to choose which customer will get delivery first. It is a convenient way of passing on the responsibility and the headaches to government, but tends to prolong rather than shorten the period of regulation by Washington.

Russia, France Want Tools

The French and Belgian governments have been allotted about $5,000,000 of the $75,000,000 of machine tools originally destined for Russia and recently cancelled by termination of lend-lease aid to the Soviet. Both governments want more of these machines, up to a total of $18,000,000, but further decision as to the final volume is being held up by the Foreign Economic Administration until Russia has an opportunity to take for cash the machines she was to get under lend-lease. Russia has been slow in deciding what she wants on a cash basis, and FEA is likely to set a deadline beyond which these machines will not be reserved for Soviet purchase. Russia already has bought some machine tools for cash. Many tools ordered for Russia under lend-lease have been completed and shipped to warehouses dsignated by the U.S. Treasury Department awaiting final disposition. Machines for Russia that cannot be finished by August 1 are expected to be cancelled.

Machine Tool Output Steady

Machine tools are not a bottleneck in resumption of automobile manufacture. Deliveries beginning in August will run through October. The tightest item is heavy presses for stamping sheet-steel parts. From the standpoint of a long-term program, construction of new plant facilities will prove to be the limiting factor in automotive operations. The machine tool industry is likely to continue shipments at about the same rate as recently, slightly over $40 million a month. Surplus machine tools are not coming on the market fast. The total declared surplus up to now is around 22,000, of which some 12,000 have been sold.

Equipment Bureau Head

John Chafee, heretofore director of the tools division of the War Production Board, has been named head of the newly created equipment bureau of WPB. This bureau comprises the aircraft, transportation equipment and shipbuilding divisions, service equipment division, construction machinery division and the automotive, farm machinery and equipment, general industrial equipment and tools divisions. This action was taken to secure a more compact administrative structure in view of the declining load on some board units. Paul S. Gaston, former deputy director of the tools division, has been named director of that division.

Postwar Jeep—Taking off its olive drab uniform and changing to bright-colored "civies," the G.I. jeep makes its bow as a civilian vehicle. This war-famed automobile has been adapted for peacetime use through the addition of features for comfort and utility according to Willys-Overland Motors, its manufacturer. It will have a power takeoff making 30 hp. available for anything from a buzz saw to a thresher. Improved springs and shock absorbers have been added. The jeep's agricultural prowess was demonstrated recently on the farm of Charles E. Sorenson, Willys president

Preview — Viewing the scale model of General Motors projected technical center, "scientific and engineering workshop of tomorrow" are W. J. Davidson, executive engineer; C. L. McCuen, v.p. in charge of engineering; Charles F. Kettering, v.p. and director of research; and Harley J. Earl, v.p. in charge of styling. This streamlined group of buildings is designed to meet the needs of the Corporation's research, advanced engineering, styling and process development. It will be erected just outside Detroit

War Needs for Flat-Rolled Steel May Halt Rate of Reconversion

PITTSBURGH—The steel industry, at the moment, has its usual quota of problems including a troublesome sheet situation, manpower difficulties and—looming over the horizon—a potential coal shortage which could spring from a combination of labor troubles and inadequate transportation facilities.

Most attention is being paid to the sheet problem for here is the key to the entire reconversion problem. The WPB aimed to assist by freezing order books for the third quarter, but this was amended to apply only to orders for September delivery. Rated business was not affected.

Since most producers report they are heavily committed on rated business, which will take them into the fourth quarter and beyond, the assumption is that the WPB expects cancelations to provide some opening for unrated business. It is not clear who will channel what orders into such openings, but there will be no lack of requests for tonnage.

Pacific Requirements High

The Pacific war requirements for light flat-rolled material are proving to be greater than had been anticipated. In most other lines of steel products, there have been definite cutbacks, and this has increased the availability of ingots for light flat rolled but in many cases sheet requirements for war actually have increased.

What has been given up through a cutback in landing mats has been offset through increased need of ammunition containers, and there are heavy requirements for drums. Ammunition could be shipped to Europe in fiber containers, but climatic conditions in the Pacific require metal of special construction.

Despite reports that there is no opportunity to produce sheets for automobiles—and in some cases for rated washing machines and refrigerators—no complaints are heard from these industries about lack of materials. True, they are not yet in volume production, but they are turning out some goods, and this flow will increase. Wagers are being made that material handicaps will prevent the automobile industry from turning out its quota of 245,000 cars in the last half of 1945. In some quarters, there appears to be more concern how an enlarged auto production program can be carried out in 1946. In this connection, it appears that plant expansion of sizeable amount is in the cards. As a result, there is a tendency toward increased business in structural shapes as a result of WPB authorizations. American Bridge Company here, for instance, has booked 11,000 tons for a Chevrolet assembly plant in Flint, Mich., which is the largest known individual tonnage for an expansion project in the auto industry to date.

More Labor Needed

The steel industry is putting as much slab tonnage through the hot flat rolled mills as it can—based on the ability to handle after it comes off the hot mill. Labor recruiting is still under way for the cold mill departments, and this tonnage is coming up gradually. There are limits on pickling and furnace operations as well as manpower problems in other phases of the flat-rolled processing. An enlarged tin plate program causes a heavy drain on available hot-rolled strip.

Bars and Plate in Better Shape

Demand for bar stock is good, but there is a moderate balance here. The long-term trend is toward oversupply. The decline in plate business has slowed up as a result of ship repair needs and priorities for the building of railroad equipment. This latter, in time, will require substantial tonnages of plates and special shapes.

While wire demand is heavy, the problem of meeting requirements is not acute.

The overall situation in the steel industry has taken a favorable turn for the management, despite intermittent strikes and manpower shortages. Except in acute cases, like sheets, the pressure has gone down, and at an average ingot production rate of 90 percent, the mills are turning out their product at what is considered to be the most economical level of output. The idle 10 percent permits the making of necessary repairs and leaving out the most inefficient of the available facilities. Prices are a constant source of irritation to management, but less is heard about them now.

RFC Reports Machine Tool Sales From Surplus for Fifty Millions

WASHINGTON — The Reconstruction Finance Corporation, the agency designated to sell surplus capital and producers' goods, announced that, as of May 31, 1945, it had sold surplus property valued at $235,380,000 for $133,462,000.

The surplus "on hand" represents $535,786,000 of salable property; the balance of $934,618,000 represents non-salable property (mostly nonflyable combat aircraft.)

The monthly summary of surplus property gives detailed statistics on eight categories of machine tools on hand:

Boring machines	$ 8,050,000
Drilling machines	5,820,000
Gear-cutting and finishing	2,103,000
Grinding machines	6,627,000
Lathes	11,920,000
Milling machines	8,187,000
Miscellaneous, and other machine tools	7,079,000
	$50,761,000

A new tabular form in the summary presents the surplus holdings by RFC agencies of which there are 31 located throughout the nation.

Detroit Letter

Auto Output Slows

The mid-summer doldrums have hit the automobile industry. After the initial flurry, caused by the Ford Co. rushing into production of its first cars, the race to get cars onto assembly lines has slowed down to a lethargic walk.

This is due to several reasons. Until recently, the industry had but a vague idea of what the materials situation was going to be. Also, it had no price policy from the OPA, although their suppliers, the parts manufacturers, had been waging a battle to force a decision from that agency which might set a pattern for the industry. A third problem, also still unsolved, is the matter of distribution.

The recent meeting of the industry meeting with WPB Coordinator Henry Nelson cleared the materials situation to a degree. They found that the most critical item for which they must substitute is tin.

Controls May Be Lifted

Even more encouraging to the industry was WPB's attitude on controls. It was indicated that all controls would probably be dropped by the end of the third quarter, and rationing of cars could be expected to be wiped off the regulations by the first of the year.

This was tied up realistically with the fact that WPB did not seriously expect to limit production in the first year to the 2,000,000-car minimum. Within the next few weeks, auto manufacturers will be given the go-ahead on the billion-dollar post-war expansion program it contemplates. This will include not only additions to present plants but a whole system of nationwide assembly plants which will help the industry obtain the 6,000,000-car year rate needed to satisfy the market.

Unemployment a Factor

All of WPB's aims are tied up with the jobs situation. By September, cutbacks will be reflected in nationwide unemployment, instead of the spotty surpluses in certain areas like Detroit. With an eye on this dangerous plight, the feeling is that whatever will create jobs next year should be done right now. So car makers will attain their postwar expansion long before they anticipated it.

Insofar as actual car production is concerned, there seems to be no tendency on the part of the industry to rush matters until it can see just where it is going. In view of this cautious approach, it may be mid-September before any sizable production can be attained.

Chrysler May Trail

The next company expected to be producing automobiles is Chevrolet or Pontiac. Olds may be close behind, and Hudson will be in the forefront. Of all the car producers, Chrysler divisions now appear to be the laggards. This is due to two things: first, K. T. Keller's ironclad insistence that the war job is more important than private cars, and second, the diversity of Chrysler war contracts. Even Plymouth, which ordinarily would lead off, is hard pressed to find a place to shift its war assignments so it can join the parade. Dodge and DeSoto are in a little better position to make cars but none of the divisions can be said to be as open as most of the GM subsidiaries.

Pricing a Problem

Of all the problems confronting the industry, the pricing situation seems the most complex. Every manufacturer is with OPA in its desire to keep inflation down and prices with it. Most of them stand ready to take a loss on the first cars, until sizable production is reached.

But higher labor costs plus less efficiency from the workers are items which cannot be swallowed whole by the car builders. Ford officials state frankly that they have asked for a "substantial" boost in their prices and place the labor factor at 25 percent higher.

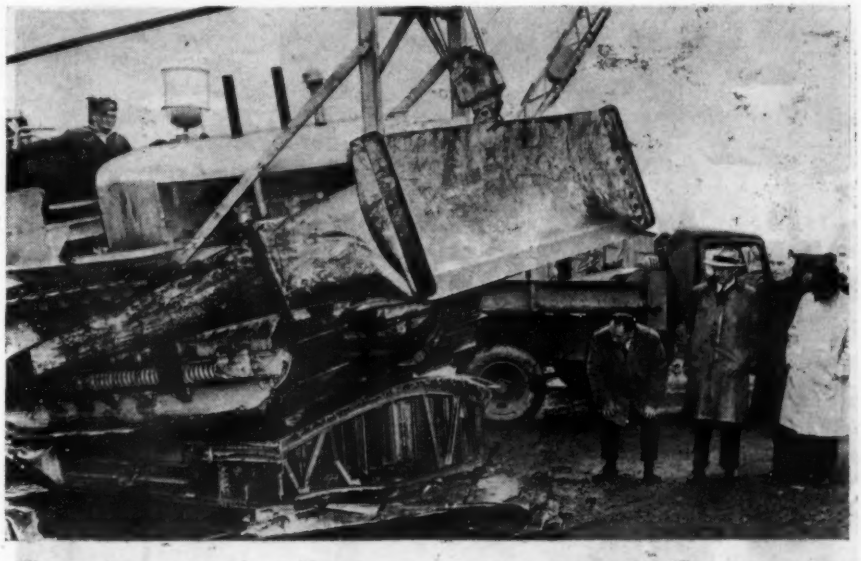
OPA, frustrated in trying to gather the industry around one table to work out a formula, now is taking it up individually. The competitive nature of the industry could not be cracked even by the imperative need to get a quick decision on prices.

Parts Men Peeved

The Automotive Parts Manufacturers Association is indignant over the price stalling that has been done by OPA. One large carburetor manufacturer has openly threatened to close his shop rather than continue to take losses under present ceilings. Others may follow suit and the unemployment menace may grow from that direction. The effect on auto manufacture may be unhappy too.

The hint in Washington is that without going to the parts men, OPA may establish an over-all increase in car prices. This would put the manufacturers in the position of dealing individually with their suppliers on prices, the old system which the latter always resented and hoped to get away from.

Meanwhile, between the two unsolved puzzles of prices and distribution, the token production attained by Ford is going into warehouses until both are solved. So far, the company's output is modest but by next month, it is expected to be sizable. What happens then, with warehouses clogged, remains to be seen. It seems to be up to Chester Bowles.



Tough Wing—If a turkey had wings as durable as this, the Thanksgiving Day dinner would be spoiled. When disposal experts of the Air Technical Service Command's supply division and officials of an aluminum company gathered to watch the preparation of scrap metals for rail shipment, an 11-ton bulldozer was run upon a wing section of the Consolidated Vultee Liberator. The effort to crumple it failed completely

Canadian Firms Buy War Plants With Excess Profits Tax Credits

MONTREAL—A partial answer to what is likely to happen to government-owned war plants in Canada is seen in the recent authorization by the Cabinet whereby purchasers of such plants are permitted to pay for them out of the refundable portion of their Excess Profits Tax.

This precedent is established in orders-in-council affecting the John Inglis Co. plant, at Toronto, and Hayes Steel Products, at Merriton, Ont. In both cases the deal affects property and equipment set up by the Government as part of a joint company-government wartime expansion, the balance above the excess profits credit being payable in ten annual installments.

The expectation, as noted in both orders-in-council, is "that the said capital expenditures will contribute to the postwar conversion of the business, and provide substantial employment."

Shipbuilding Subsidy Advocated

On a competitive basis Canadian shipbuilders can equal or better the shipbuilding efforts of any other country if given support from the government and from the people, T. R. McLagan, vice-president and general manager of Canadian Vickers, Ltd. declared in an address to the newly-formed Canadian Shipbuilders Association at Ottawa recently. McLagan advocated a maritime commission for Canada similar to the U. S. Maritime Commission.

He denied that Canadian shipbuilders had made "tremendous" profits out of wartime operations. 54 cents of every dollar received went into materials, 40 cents for labor, 1.33 cents for depreciation, 0.33 cents for interest, 3.66 cents for taxes—"which leaves the builder with a profit of 0.33 cents on the dollar," he declared.

McLagan was of the opinion that Canada, in addition to building ships for herself, should be prepared to build them for other countries—for South American countries, for Britain, even if it were necessary to subsidize Canadian workmen's wages to keep them on a par with those paid in Britain and Sweden.

Atlantic Air Service Started

For the past two years Trans-Canada Air Lines, a state-owned service, has been operating a number of converted Lancaster bombers on the Atlantic service. The inauguration of a fare-paying transatlantic service by TCA is now announced, to start September 1. There is a long waiting list of passengers and it is not expected that there will be any more than limited accommodation "for businessmen" at least for awhile.

Canadian civil aviation policy gives TCA a virtual monopoly in Canada. In line with this policy a number of four-motored Douglas DC-4s are being built in Montreal and airports are being expanded across the country. It now is apparent that TCA will also be the official Canadian airline operating on an international scale.

Reduction in aircraft manufacture in Canada, for war purpose, is offset to some extent by manufacture of the Lincoln bomber for use in the Pacific war at Malton, Ont., where Lancasters were formerly made. The present target for the Lincoln is 20 a month, and these will go to the R.C.A.F.

Truck Output Near Peak

Production of trucks and other vehicles at General Motors plant in Oshawa, Ont., on government contract is only slightly below the peak war figure, and this condition is expected to continue for some time. The greater part of all General Motors production has been directed to the Pacific war needs, and in addition, large quantities of vehicles are being produced under government contract for the liberated countries of Europe and for UNRRA. At the same time consideration is being given to local needs, particularly in trucks which are urgently needed for Canada's motor transportation industry.

British Underground—Unknown to most Londoners during the war years was a subway factory which turned out airplane parts. The factory, now closed, was deep in the passage beneath the Earl's Court subway station and was manned by London transport workers during their spare time

Compromise on British-American Screw Thread Standard Likely

LONDON—Little has been said about the results attained in attempts to standardize British and American screw threads. Interviews in London this week indicate that British engineers are likely to accept the 60-deg. thread as standard, rather than their 55½-deg. thread. Also, it is reported, that rounded roots and flat crests are likely to be the final recommendations of the Combined Conservation Committee, which is integrating the production program of the United States, the United Kingdom and Canada. If the British accept the 60-deg. thread, it is possible that American members of this committee will compromise on thread pitches and accept British standards.

The National Physical Laboratories in Britain is making exhausting tests on all types of threads. The results of these tests will be considered carefully by the British before finally adopting 60-deg. threads, or accepting a change from rounded roots and crests. The results of these tests may be available this fall, and should this be the case, concrete results may be expected from the next Anglo-American conference.

This conference will be held this autumn in Canada. An agenda has been drawn up covering unification of engineering standards, screw threads, pipe threads for use in aircraft and other fuel and gas line, limits and fits which affect the practice on which depends the intelligibility of drawings to engineers on both sides of the Atlantic.

Washington Bulletin

Three or One?

Sen. Tom Stewart (Tenn.) has introduced a bill calling for separation of the Surplus Property Board from the Office of War Mobilization and Rehabilitation and for its complete independence, with complete authority over war surpluses. Stewart would retain the present three-man authority, to be replaced by a one-man administration after the war. Rep. William M. Colmer, chairman of the House Postwar Economic Policy Committee, announced that he will place the President's recommendation for a single official before Congress.

When peace comes the armed services and other war-connected agencies will have about $70 billion worth of surplus goods on their hands, about three-quarters of it in the combat category. Of the remaining quarter, perhaps half will be abroad. The remaining portion in this country, usable by civilians, boils down to about $6 to $10 billion. This includes about 500,000 machine tools, owned by several federal agencies, and vast stores of supplies and equipment of interest to the metal-working industry. In addition, there are about $5 billion worth of convertible plant facilities, many of which will affect, or be useful to, this industry.

The President does not say that the surplus property authority should be independent of the OWMR. It is hard to see how such large transactions in goods, affecting the transition from war to peace, could be independent of war production and rehabilitation after war. But Sen. Stewart does call for independence. Board members themselves privately ask for some sort of autonomy. Congress, as it always does, will enact a compromise measure.

Quick—But Better?

No matter how much authority or independence the administration of surplus war property may be given, the disposal program will be governed by pressures from without. The disposal of war goods is glittering gold to promoters, and they are behind the scenes in packs. The surplus agency can never tell the owning agencies—Army, Navy, Maritime Commission and others, what they shall declare surplus. SPB, or whatever succeeds it, can merely make policy under which the disposing agencies—Reconstruction Finance Corporation, Department of Commerce, Federal Works Agency, and seven or eight others—are to operate. SPB independence, and its replacement by one official, could result only in *quick* decisions. Such action might not bring any *better* decisions. The main reason for criticism up to now is that Congress and the public itself don't know what they want done. No matter what's done, it's wrong.

Advice Ignored

In the Surplus Property Act of October, 1944, Congress over-rode the recommendations of President Roosevelt, Bernard Baruch, William Clayton (who headed the original Surplus War Property Administration), and War Mobilizer James Byrnes. The reason was, as near as anyone can determine, that both liberals and conservatives teamed up for a board. Each side seemed to think they could swing more influence on selected members than they could upon an individual official, who might be the wrong man.

Meanwhile, as the President calls for revision of the law, W. Stuart Symington takes office as chairman of the Board, replacing Sen. Guy M. Gilette, whose tenure was made so miserable by internal friction that he resigned. The other two members of the Board are Robert A. Hurley and Lieut. Col. Edward H. Heller. The chairman has no authority and is merely a member. Any two members can make a decision. In addition to the Board there is an Administrator, A. E. Howse, who has very little legal authority. But this particular administrator, Howse, throws his weight around and frequently dominates the Board's actions. Hurley and Heller coast along together, and either on their own initiative or under the influence of Howse, can obstruct Mr. Symington, should that gentleman wish to differ strongly with them.

New Surplus Chief

W. Stuart Symington

WILL HE WALK ALONE?

WASHINGTON—A single head for the Surplus Property Board was advocated by President Truman in a special message to Congress one day after W. Stuart Symington had taken office as chairman of the present three-man board. The President pointed out that, with the growing volume of surplus property to dispose of, it is undesirable to complicate decisive action by a diluted responsibility. A bill to carry out the President's recommendation will soon be introduced in the House.

A Lot Expected

Few weeks ago Sen. Joseph C. O'Mahoney, heading a Senate Subcommittee, took a brief look into the surplus property situation. Undoubtedly more investigation will be followed by action this fall. Nearly $4 billion worth of surpluses were badly handled by the owning agencies following the last war, under blanket Executive authority. This time the pot is several times bigger, and the public expects more surveillance by the government. Congress will take the responsibility, for better or worse. The Hill will have to decide (1) whether to set up a one-man authority for fast action; (2) whether to give the authority broad responsibility, risking large errors of judgment, or continue and amplify the present maze of legalities in which almost every surplus property deal becomes entangled.

Lincoln Electric Conducts Three Special Welding Courses

CLEVELAND—Courses consisting of a two-week training period to instruct enrollees in the technique of arc welding the common steel alloys and non-ferrous metals are announced by the Lincoln Electric Co. A second course of one week's duration covers welding sheet metal in thicknesses of from 12 to 20 gage. A third, two-week course trains students in the welding of pipe from 2 to 10 in. in diameter.

Courses are under the supervision of Arthur Madson, veteran Lincoln instructor, at the company's Cleveland plant. In previous courses, the Lincoln School has trained over 25,000 people.

Spotting the Air News

Jet for Light Planes

Many months ago, in a private conversation, T. P. Wright, administrator of civil aeronautics, dropped an offhand comment that the shutter-valve or "resonance" engine, used on the German V-1 buzz bomb and now in production by Ford, might some day be applied to light airplanes. Certain of Mr. Wright's associates, fearing he would be put down for a visionary, requested that the comment not be attributed to him. Today, three or four manufacturers, among them probably General Electric, are working on shutter-valve engines for light planes. Such engines, in the opinion of interested engineers, can be built to retail for about $50, and weight about a tenth as much as present power plants of comparable power, which cost from $400 to more than $1000.

The shutter or reed-valve engine is a jet machine. Instead of using a compressor it takes in air at the front under the ramming effect of its forward speed. Air and fuel mixture pass through a multiplicity of reed valves; ignition backpressure lets the spring valves close, and the expanding gases are forced out the jet nozzle to the rear. The "resonance" or internal pulsation, like that inside a musical instrument, is at the rate of about 40 per second in the Ford version of the German flying bomb.

This light jet engine development has three serious faults, so far. The noise is disturbing and painful; vibration is enervating to persons and damaging to airframe; fuel consumption is beyond reasonable economy. In addition, the principle of jet propulsion, being efficient at higher speeds, is not yet adaptable to private aviation. But all these problems may be solved in time.

They Won't Talk

Russian, British, American and French zone commands in Germany are supposed to exchange all captured technical data, but actually each is said to be holding out some of its best finds. Investigators just back from Germany told this writer they expect no more important specimens and information from other than the American zone. Chances are against any really important discovery. One possibility is Nazi progress in the release of atomic energy which some engineers have hoped could become a cheap source of airplane and other power. Russia's eastern section has the least industrialization, but this lack is compensated by its food production.

Designers of highest authority have again and again dismissed the economy of towing gliders with passengers and cargo. One of them recently said he saw no sense in adding the drags of unpowered units together, connecting them with a piece of string, and pulling them with a tow plane, which might as well be built to contain all of the cargo its own power can fly. Nevertheless, the Douglas Aircraft Co. sees fit to announce that its C-47, military version of the well known DC-3, can be converted to a glider that will stall as slow as 35 m.p.h., glide and an angle of 14 to 1, and tow at high speed. Douglas' proposed performance is better than the Army's standard CG-4-A glider's 55-m.p.h. stall and sinking angle of 12 to 1. If postwar air transport has use for big gliders, thousands of C-47s will be on hand for conversion, and they will stand as a competitive threat to the several companies that have large gliders in development.

Old Ships Still Good

Laymen interested in air power can stand telling more than once that old aircraft designs carry the brunt of battle, in this and other countries. Most recent example is United Aircraft's Chance Vought Corsair F4U-4 ship-based fighter. This airplane was designed before U. S. entry into the war, was always valuable, but at one time was ruled off carrier decks and ordered to fight from land bases. It's rugged construction, great power, high speed, heavy armor and armament have given it superiority over the quicker turning and faster climbing Japs. The new version has still greater power, which gives it speed and ceiling, and 1000 ft. per min. additional climb, to exceed the performance of any Jap fighter. Other old airplanes, getting better with age and still in the battle, are: the Boeing B-29 Superfortress; the Republic P-47 Thunderbolt; North American P-51 Mustang; Grumman F6F, Douglas DC-3 and DC-4 cargoplanes; Martin PBM Mariner and Mars cargo seaplanes; and oldest of all, the Consolidated Catalina PBY patrol bomber seaplane. There are others. In fact, there are only three or four new designs to enter the war, unless it lasts unexpectedly long. One of these is Lockheed's P-80 Shooting Star jet fighter for the Army, and a jet fighter by Ryan.

General's Cabin—A B-25 Mitchell bomber served as the flying headquarters of Gen. Dwight D. Eisenhower during the European campaign. Shorn of armament, the plane was modified to meet the general's needs, including radio equipment to keep in touch with the ground. Besides facilities for the general and three aides, the flying headquarters carried a crew of four, including the pilot, co-pilot, radio operator and crew chief. On the aerial work bench seen in the cabin plans were drawn by the general

Industrial Electronic Course Announced by General Electric

SCHENECTADY, N. Y.—A slide film training course offering a practical understanding of industrial electronics has been announced by the General Electric Co. Organized for presentation in twelve sessions, the course should provide electrical personnel with sufficient theory and application information to acquaint them with electronics in general.

Names in the News

R. A. Cole

G. A. Custer

Raymond A. Cole has been elected vice-president of the Pope Machinery Corp., Haverhill, Mass. He was previously experimental engineer with Norton Co., Worcester, Mass.

G. A. Custer has been promoted from chief engineer to general factory manager of the Peninsular Grinding Wheel Co., Detroit, Mich.

Russell G. Akin has been appointed director of sales and advertising by the board of directors of Littelfuse Inc., with plants at Chicago, Ill., and El Monte, Calif.

Thomas C. Barber has opened offices at North Dearborn St., Chicago, Ill., as representative for the Buhr Machine Tool Co., Ann Arbor, Mich., Carbide Fabricators Co., Royal Oak, Mich., Morse Tool Co., Detroit, Mich., and Kelly Reamer Co., Cleveland, Ohio.

J. F. Campbell has been appointed as chief development engineer and **R. W. Phillips** as laboratory director of The Weatherhead Co., Cleveland, Ohio.

George A. Delaney has returned to the Pontiac Motor division of General Motors Corp., as assistant chief engineer. Since 1942 he has been on a leave of absence with another division of General Motors, serving as equipment engineer on B-29 contracts.

Berton H. DeLong and **Paul B. Greenawald** have been appointed directors and vice presidents of the Carpenter Steel Co., Reading, Pa.

William A. DeRidder has been elected president and general manager of Adel Precision Products Corp., Burbank, Cal.

T. C. Downey has been appointed assistant manufacturing manager for Oldsmobile, Lansing, Mich., after 29 years service with General Motors Corp.

Arnold Facius and **R. L. Hickey** have been appointed vice-presidents of Andover Motors Corp., Inc., Elmira, N. Y.

W. W. Foster has been appointed Plomb sales manager for the Southwest region of the Plomb Tool Co., Los Angeles, Calif.

G. A. Gustafson has been appointed construction manager of the General Electric Plastics Divisions, Pittsfield, Mass. General Electric Co. Mr. Gustafson, who has been manufacturing manager of the Plastics Divisions since 1942, will be succeeded by **L. S. Gleason,** manager of the Pittsfield Molding Works.

E. S. Wellock, for the past three years plant manager of Chevrolet's transmission division, Saginaw, Mich., has been appointed assistant general manufacturing manager in charge of Chevrolet's eleven assembly plants, succeeding **E. C. Shaw,** resigned. **Caryl Chaney,** Mr. Wellock's successor as plant manager at Saginaw transmission, has been general superintendent there since 1938.

Promoted by General Motors

E. S. Wellock

Caryl Chaney

G. W. Frick

A. R. Zapp

George W. Frick has been appointed general sales manager and **A. R. Zapp,** carbide products manager of Firth-Sterling Steel Co., McKeesport, Pa.

C. C. Hermann, Detroit, Mich., has severed relations with Claude B. Schneible Co., Chicago, Ill., as general manager. After a short rest he will enter the field of consulting mechanical engineer specializing on foundry design and dust control.

Hubert Jagger, inventor of many duplicating devices and machines, has resigned from his position with Ditto, Inc., Chicago, Ill., to take up his new duties as production manager for the Niagara Duplicator Co., San Francisco, Cal.

W. J. Maguire has been appointed general production manager of the Chrysler division, Chrysler Corp., Detroit, Mich.; **F. A. Wunderlich,** works manager of the Chrysler-Kercheval plant, and **A. P. Callies,** works manager of the Chrysler-Jefferson plant.

R. L. Miller has been appointed sales manager of Norma-Hoffmann Bearings Corp., Stamford, Conn., and **E. M. Beers, Jr.,** and **G. V. Titsworth** have been appointed assistant sales managers.

James L. Ray has been named turbine department head at Joshua Hendy Iron Works, Sunnyvale, Calif.

William Cordes Snyder, Jr. assumed the presidency of the Continental Foundry & Machine Co., Pittsburgh, Penn., last month. In addition to serving as president he will also take over the duties of general manager.

Robert F. Tucker, staff assistant to **Ralph C. Stuart,** Westinghouse Electric Corp., vice president, has been appointed manager of the recently acquired Ken-Rad Lamp Division.

Frank E. Walling, vice-president in charge of operations of the Lewis Foundry & Machine Division of the Blaw-Knox Co., Pittsburgh, Pa., has been named acting manager of the division to succeed **W. C. Snyder, Jr.,** resigned.

P. J. Moore

H. L. Huntley

A. H. Heywood

S. W. Sparrow

Paul J. Moore has been elected motor sales manager of Star Electric Motor Co., Bloomfield, N. J.

Harry L. Huntley has been appointed headquarters repair sales manager of the 34 plants of the manufacturing and repair department of the Westinghouse Electric Corp., Pittsburgh, Pa.

Andrew H. Heywood has been appointed manager of the motor application department of the Westinghouse Electric Corp., East Pittsburgh, Pa.

Stan W. Sparrow, chief aircraft engine test engineer, Studebaker Corp., South Bend, Ind., has been appointed director of research and development of an operating committee to pave the way for the resumption of normal automotive operations.

Harry A. Feldbush has been named vice president in charge of engineering of the Holyoke, Mass., plant of Worthington Pump and Machinery Corp., Harrison, N. J.

BUSINESS ITEMS

AMTEA Corp., New York, New York, export sales and engineering organization serving Latin American users, has added four more companies to associate membership: **Abrasive Machine Tool Co.,** East Providence, R. I.; **Baker Bros., Inc.,** Toledo, Ohio; **Lake Erie Engineering Corp.,** Buffalo, N. Y.; and **V. & O. Press Co., Inc.,** Hudson, N. Y.

Facilities of **Bendix Aviation Corp.,** Red Bank, N. J., are being organized into a separate division to be known as the Red Bank division. **H. A. Poole,** present plant manager, continues as operating head, and becomes assistant general manager of the new division

Borg-Warner International Corp., Chicago, Ill., will act as sales representatives in all export markets, with the exception of Canada and Alaska, for **Tyson Bearing Corp.,** Massillon, Ohio.

First York Corp., and **Utility Equities Corp.,** Wall St., N. Y., have acquired an interest in the **American Foundry Equipment Co.,** of Mishawaka, Indiana. The management of the company remains as at present.

Federal Products Corp., Providence, R. I. has set up a field engineering service department to co-operate with the users of its instruments.

Graham-Paige Motors Corp., Detroit, Mich., is establishing its farm equipment division at the **Warren City Manufacturing Co.,** the company's subsidiary in Warren, Ohio.

F. L. Jacobs Co., Detroit, Mich., manufacturers of precision automotive parts, has acquired a plant at Holly, Mich., to be operated as a plating and machine unit of its subsidiary, **Continental Die Casting Corp.**

Light Metal Machinery, Inc., Erie, Penn., a new firm entering the manufacture and distribution of high-production machines for the fabrication of zinc, aluminum, magnesium, and other light metal alloys, has been organized. President of the new concern is **Ward F. Martin.**

Link Belt Company's Ewart Works, Indianapolis, Ind., has started construction of two additions to cost approximately $500,000.

Lion Fastener Co., Inc., formerly Lion Cowl Fastener division of **Talon, Inc.,** at Meadville, Pa., has been formed by Rochester interests. **S. S. Frankel,** president of the **Rochester Iron and Metal Co.** and **Robeson Cutlery Co., Inc.,** is president of the new firm.

Metal Craft Foundry, an aluminum die-casting firm also specializing in technical service in design and stresses, opened in Seattle, Wash., the first of July. President of the new company is **C. E. Kammeyer.**

Miller Keyless Lock Co., of Kent, Ohio, has been purchased by **C. L. Cougler,** president of the **C. L. Cougler Machine Co.,** Kent.

Reliance Electric & Engineering Co., Cleveland, Ohio, has appointed two new distributors for their products: **Standard Electric Motor Works** of Detroit, Mich., and the **C & G Sales and Engineering Co.,** Milwaukee, Wis.

Security Engineering Co., Inc., Whittier, Calif., will be acquired by **Dresser Industries, Inc.,** Cleveland, Ohio, to further round out the activities of the 13 Dresser member companies now serving the petroleum and gas industries.

The Studebaker Corp., South Bend, Ind., will spend more than $1,500,000 to concentrate all of its war production activities in a single building.

Swind Machinery Co., Philadelphia, Pa., has been appointed as exclusive dealer for the sale of **Norton Co.,** Worcester, Mass., grinding and lapping machines in eastern Pennsylvania and Maryland, southern New Jersey and Delaware.

Tate-Jones and Co., Inc., has moved its executive, engineering and sales offices from Leetsdale, Pittsburgh, Pa., to the Plaza Building, downtown Pittsburgh.

OBITUARIES

E. Werner Fritzell, 44, co-partner with his father, Oscar, in the Phoenix Tool and Manufacturing Co., Chicago, Ill., and past president of the Tool and Die Institute of Chicago, Ill., died recently.

Henry D. Miles, 80, for 45 years head of the Buffalo Foundry & Machine Co., Buffalo, N. Y., died recently. He became president of the firm when it was founded in 1900. In April 1945 he was elected chairman of the board.

Carol G. Olson, 70, vice president, director, and one of the founders of the Illinois Tool Works, Chicago, Ill., died July 3 at his home in Chicago. Mr. Olson, one of the organizers of the company in 1912, had received many honors for his numerous inventions.

Robert L. Stevenson, 60, one of Cleveland's leading mechanical engineers died July 11. Mr. Stevenson was invited by the Russian government to establish a modern farm tool plant in 1930 and remained until it was in full operation in 1932. He was plant manager of the Empire Plow Co., Cleveland, prior to his trip to Russia.

Shop Equipment News

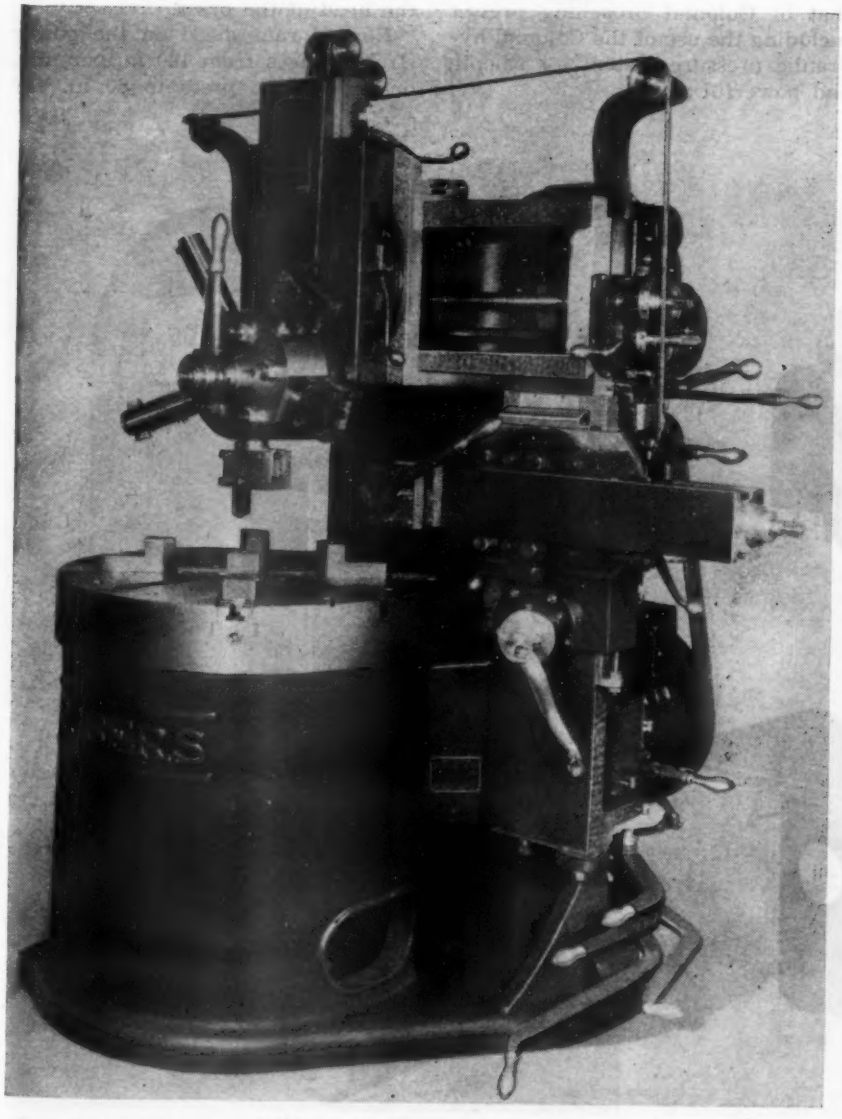
Rogers Vertical Turret Mill Redesigned, Increases Flexibility

Announcement of over a hundred engineering additions and refinements in the Rogers "Perfect 36" vertical turret mill has been made by the Rogers Machine Works, Buffalo 7, N. Y. Rogers mill is equipped with an adjustable 5-position main vertical turret that provides tool settings for boring, drilling, reaming, turning and thread cutting. Quick acting lever permits rapid indexing of turret head. The main stake has an adjustable swing up to 30 deg. each side of vertical in addition to being adjustable left to right and up and down. Specially designed swivel sidehead permits setting at any angle up to 35 deg. each side of horizontal. This sidehead is also adjustable up and down and left and right as well as being designed for indexing to eight positions.

On production runs, set-ups are accurately duplicated by setting dials which are conveniently located at eye level for the operator. In addition, the horizontal chuck is scribed to accurately locate duplicating work. Output of finished work is further increased by the motor driven rapid traverse.

Foot controls are accessible to the operator for rapid clutch and brake control and changeover of main drive speeds. Main gear box is totally enclosed and generated gears run in oil, providing both smooth operation and long gear life.

Rogers mills may be equipped with a special coolant system which delivers 2 streams of coolant to the tool and work. The coolant is delivered to the point of operation by a self-contained and self-priming pump.



Complete tooling is available with the Rogers vertical turret mill as well as 4-jaw independent, 3-jaw universal chucks or plain tables

Thermicast Produces Steel Castings Without Furnaces

Development of a special type of thermit, known as Thermicast, for producing steel castings, has been announced by the Metal and Thermit Corporation, 120 Broadway, New York, N.Y.

This type of thermit is reported to solve the problem of obtaining sound, clean steel castings, irrespective of size and intricacy of shape, when regular steel melting facilities are unavailable.

The casting material utilizes the thermit reaction, requiring neither fuel nor electric power, the reaction being carried out in a specially designed conical-shaped crucible of sheet steel lined with refractory material.

The Thermicast steel, as cast, has the following average physical properties: yield point, 39,250 lb. per sq. in.; tensile strength, 70,200 lb. per sq. in.; elongation in 2 in. 30.1 percent and reduction in area, 51.2 percent.

Nichols Double Spindle Miller Assists Production Flexibility

W. H. Nichols & Sons, Waltham, Mass., announces a line of double-spindle milling machines for light production work requiring medium-duty cuts in metals and plastics. These machines are so designed that two cuts can be made simultaneously. The machine has two opposed spindles with No. 40 milling machine taper. Adjustments are provided on this model so that the spindles may be lined up, or may be set out of line vertically 2½ in., horizontally 2½ in. and in or out 1½ in.

Another model can be supplied with two identical spindles, one directly over the other. A vertical adjustment is provided so that the center line of the spindles may be positioned from 4½ in. minimum, to 7½ in. maximum. Both models have a choice of spindle drives. They are regularly supplied with two motors, one for each spindle, so that independent selection of spindle rotation is obtained. An optional drive uses a single motor which turns both spindles in the same direction.

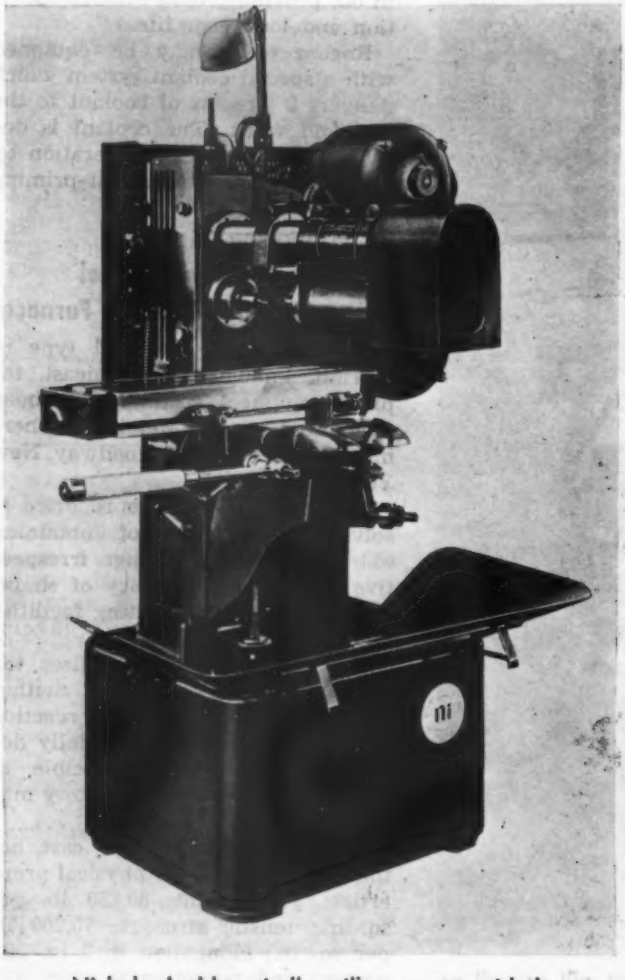
The Nichols miller has heavy alloy spindles mounted in permanently lubricated ball bearings. The spindle nose is hardened and ground. The work table is cast of special wear resistant alloy, with top ground to assure accurate location of standard work holders or special fixtures for semi-automatic production. The table is operated either by screw or by rack and pinion, and is fitted with graduated stops. All slides are pressure gun lubricated.

Colonial Hydraulic Assembly Press Gives Precise Pressure Control

A line of standardized presses, specifically designed for performing a wide range of assembly operations, has been developed by Colonial Broach Co., Box 37, Harper Sta., Detroit, 13, Mich. Basically, the operation of the presses is similar to that of Colonial broaching presses including the use of the Colonial hydraulic pressure system for smooth and powerful action.

These assembly machines—available in capacity ratings of 15, 20, 35 and 50 tons—are of reinforced steel construction with open side frame design. Motors are built-in and the direct acting hydraulic cylinder which operates the ram is built into the head of the press.

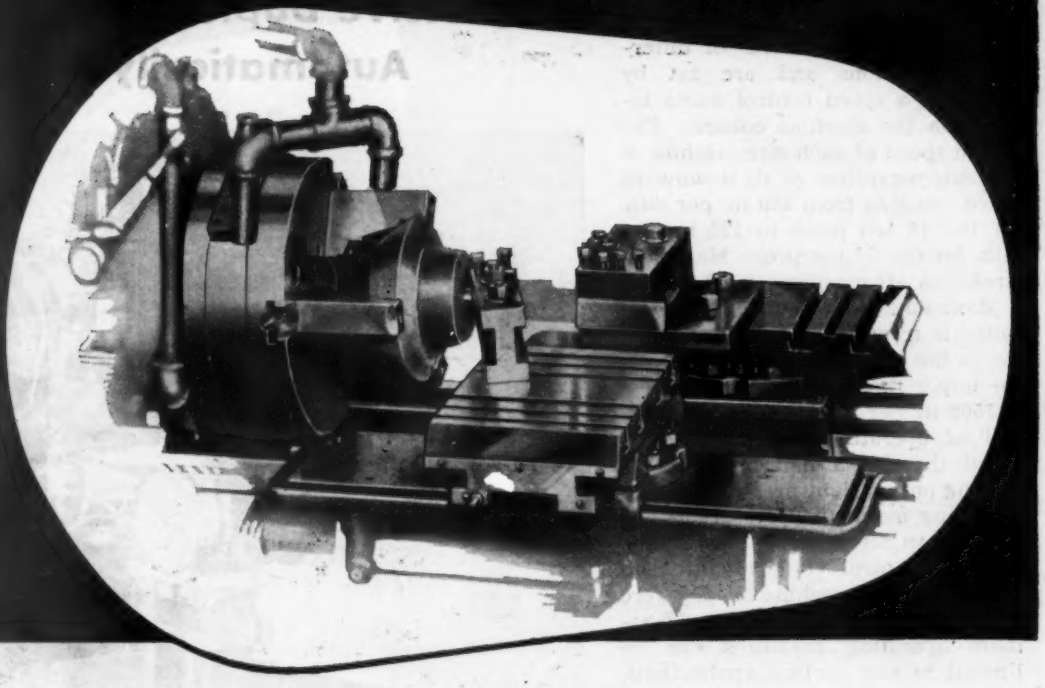
Normal ram speed on the power stroke ranges from 180 in. per min. on the 15 ton press to 60 in. per



Nichols double spindle millers are provided with dual drive systems

Colonial hydraulically operated assembly presses are equipped with control valve, hand control and gage

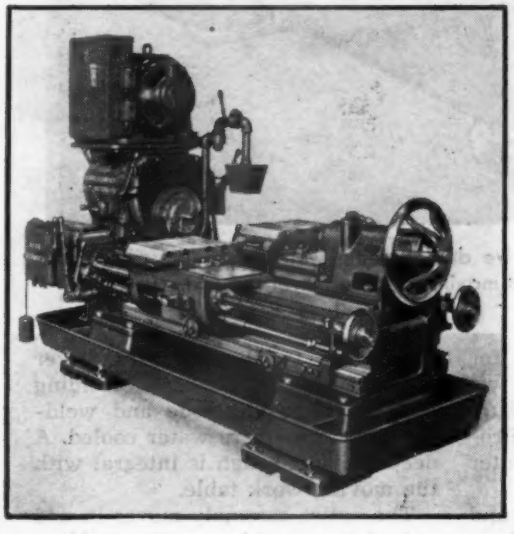
LODGE & SHIPLEY LATHES AT WORK



Maintaining High Production

ON LARGE QUANTITY RUNS

on FAIRFIELD Differentials • Bevel and Spur Gears



Do it with a **DUOMATIC**

In the plant of the Fairfield Manufacturing Company, Lafayette, Indiana, there is a complete Lodge & Shipley automatic turning department. Here 12 L & S Duomatics—full automatic lathes—demonstrate their versatility in changing over from one job to another. With Duomatics, Fairfield does all types of boring, facing and turning on parts ranging from 3" to 21" in diameter, machining various types of materials such as die forgings, hammered forgings and castings.

Frequently, Fairfield uses four and five of these lathes on the same job at the same time. Different operations are performed on each Duomatic so that finished parts are coming off one lathe while rough material is placed in another. Extremely high production rates are thus obtained, and the resultant economies quickly justify the use of such large batteries.

One Duomatic in your shop can likely replace several of your older lathes . . . do your work easier, faster, better, whether in large or small lots. Write on your company letterhead for Bulletin No. 601 for detailed information . . . or better still, ask for a personal visit from an L & S Engineer.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

min. on the 50 ton press. Ram speeds are adjustable over a wide range to meet the assembly needs of different applications and are set by means of a speed control valve located on the machine column. The return speed of each size machine is contant, regardless of its downward speed, ranging from 360 in. per min. for the 15 ton press to 120 in. per min. for the 50 ton press. Maximum stroke on all machines is 12 in.

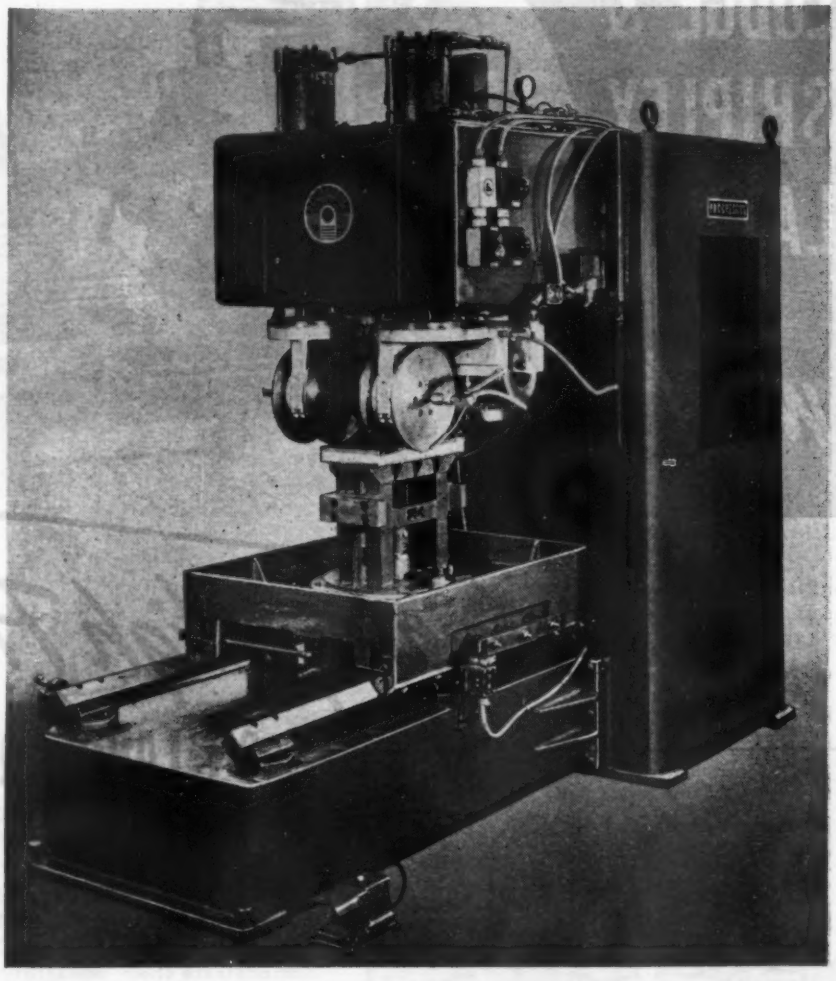
Maximum hydraulic pressure range is from 75 to 1000 lb. per sq. in., in the 15, 20, and 35 ton presses; the upper range of the 50 ton press is 1500 lb. per sq. in. Accurate control of operating pressure is provided through a hand control requiring only a light pressure. Actual operating maximum pressure is adjustable in all sizes by means of a pressure control valve mounted on the face of the machine head, where it is accessible to the operator. Maximum operating pressures can be limited to suit various applications, a feature advantageous for preventing the crushing of delicate parts under extreme pressures. If the pre-determined operating pressure should be exceeded due to misalignment of parts or errors in machining tolerances, the ram stops, preventing damage to parts. The press can not be damaged with the maximum pressure available. A pressure gage is mounted on the head of the machine, immediately above the pressure control knob, in a position where the operator has an unobstructed view of it while the machine is running. It indicates the exact pressure being applied to the work piece at all times and eliminates guess-work in the setting of the pressure control.

Standard machines are available in table heights of 33, 27, and 21 in. on all presses, corresponding to daylight space of 18, 24, and 30 in. respectively. Table size of the 15 ton press is 17x23 in.; of the 20 and 35 ton presses, 17x24 in.; and of the 50 ton press, 17x25 in. All sizes of machines have a 10 in. throat and an overall height of 85 in. Floor space of the 15 and 20 ton presses is 27x42 in.; of the 35 ton press, 29x46 in.; and of the 50 ton press, 29x50 in.

The 15 ton press is powered by a 10 hp. motor; other machines by 15 hp. motors.

Standard equipment on all Colonial assembly presses includes hand control, pressure gage, and mounting and wiring of the motor. Accessories designed for this line of machines include the pressure control valve, speed control, and a foot pedal control.

Progressive Duplex Seam Welders Automatically Join Flat Sheets



Maximum stroke of the Progressive duplex seam welder is 7 in., maximum table clearance is 16 in. and maximum table travel is 25 in. overall

Duplex seam welders, designed for simultaneous seam welding of two or more parallel seams on one surface, have been announced by Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich.

The machines are air operated and fully automatic. A duplex head on the machine accommodates either two or four welding wheels. The outer wheels are of larger diameter to provide clearance for the inner wheels while the outside wheels are used for welding. All wheels are free rotating. They are driven by contact with the moving work under welding pressure.

The work itself is carried on a work table mounted on horizontal slide rails. The top of the work holding fixture is formed by a flat copper plate which provides the lower path for the welding current between the welding wheels. Thus, the platen top becomes the lower electrode for both wheels. Welding wheels, lower electrode and welding transformer are water cooled. A deep coolant trough is integral with the moving work table.

The entire assembly moves in and out of the machine as the welding operation proceeds. Operation of the movable table is by air cylinder connected with hydraulic cylinders acting as dash pots to insure uniformly smooth table travel. Speed of the work table has a stepless adjustment range of from 0 to 30 in. per min. Limit switches engage dogs on the work table to automatically control the table travel, fixture indexing and start of the welding cycle on both "in" and "out" strokes.

Machine operation is completely automatic. The operator loads the rotary fixture and depresses the foot switch. The table moves forward

YOUR GEAR CUTTERS WILL DO

Unless designing gear cutters for every kind of job is second nature to you, it is easy to overlook little things like the fact that an .050" radius on a hob tooth will cut one size of fillet on one size of gear, another size of fillet on a different gear. Or that a shaper cutter with a 14-1/2° pressure angle in the normal plane will not produce a 14-1/2° pressure angle gear due to the sharpening angle. Or that you use the poorest part of the steel for cutting when you design the tool with the shank larger than the hob; or that you usually don't need a Class A hob when a gear is finished by shaving; or that a correctly designed hob protuberance will leave no undercut on gear teeth after finishing.

Obvious? Certainly. Yet these items are taken at random from scores of little things brought to the attention of tool purchasers by Gear Production Headquarters' Engineering Department after the order has been received.

For G-P-H engineering goes beyond designing or selecting a tool to your "order". It analyzes your requirements on the basis of experience in every phase of gear production BEFORE THE TOOL IS MADE.

If it's a G-P-H-engineered gear cutting tool, it is the right tool for the job.

Are you on the Mailing List to receive GEAR PRODUCTION HIGHLIGHTS, regularly? Ask for it on your company letterhead.

ORIGINATORS of GEAR-SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

into the machine; the welding heads depress simultaneously at the proper point and the outside pair of welding wheels make two parallel seam welds of pre-determined length. The head rises while the rotary table indexes through 90 deg. —and then the inside wheels weld on the "out" stroke of the table. Thus, two separate pairs of seam welds, each pair at right angles to the other, may be produced. The fixture indexes a second time (back through 90 deg.) at the completion of the "out" stroke and the table stops at the loading position.

Progressive duplex seam welders are available with transformer capacities up to 500 kva. to meet users' requirements; a wide range of work table sizes and travels; and many combinations of welding wheel diameters and spacings. Conventional timing and sequence controls are used. Stroke of the head is adjustable.

Snyder Special Runs 375 Pieces Hourly on 12-Operation Cycle

Two-way, automatic-cycle machines chines for performing 12 processing operations on a brass sprinkler head body are manufactured by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. The machine is a vertical, two-spindle boring unit for heavy-duty work.

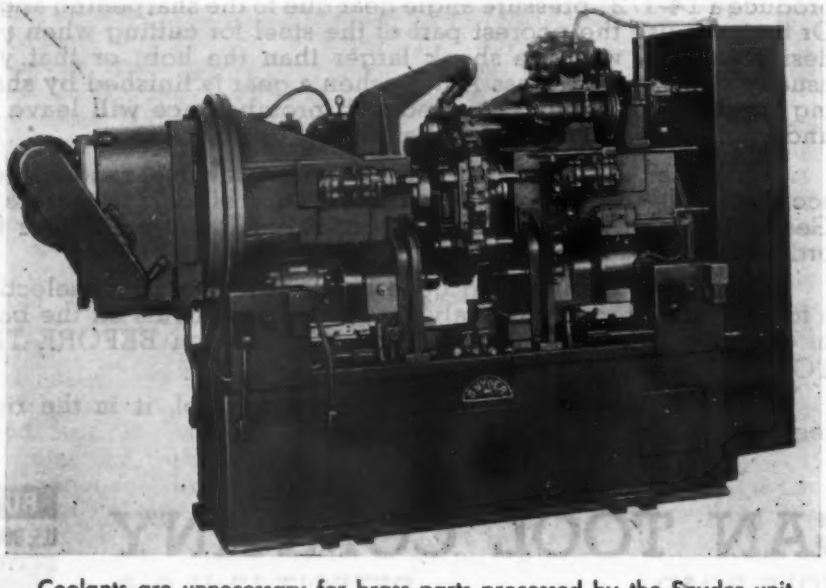
The work-piece is held in a fixture which is a double jaw, right-and left-hand screw chuck. This chuck assembly is actuated in the loading station by hydraulic cylinders. Six of these fixtures are mounted on a trunnion which is indexed 60 deg. station to station.

The work-piece is a brass casting and the operations performed are drilling, reaming, hollow milling and threading on one end, and, hollow milling, facing, drilling and tapping the other end, plus assembling and spinning in place a pressed metal deflector of which there are three sizes and shapes.

Loading the sprinkler body is a manual operation. Metal deflectors are loaded automatically from a magazine which the operator keeps filled. Each sprinkler on the individual station has a separate slide and spindle motor, and each spindle has separate hydraulic control. The hydraulic power for the operation of the tool slides and clamping and unclamping cylinder comes from a hydraulic power unit set behind the machine. The index mechanism, with large diameter locating plate, is mounted near one end of the machine and the fixture trunnion is keyed to that mechanism through a heavy trunnion shaft.

The base and trunnion bearing housing are of welded steel while the index mechanism housing and hydraulic slide bases are cast iron. Slides are hardened and ground steel.

Safety devices are provided to prevent improper operation or injury to the operator.



Coolants are unnecessary for brass parts processed by the Snyder unit

Steel City Hardness Tester Tests Material on Location

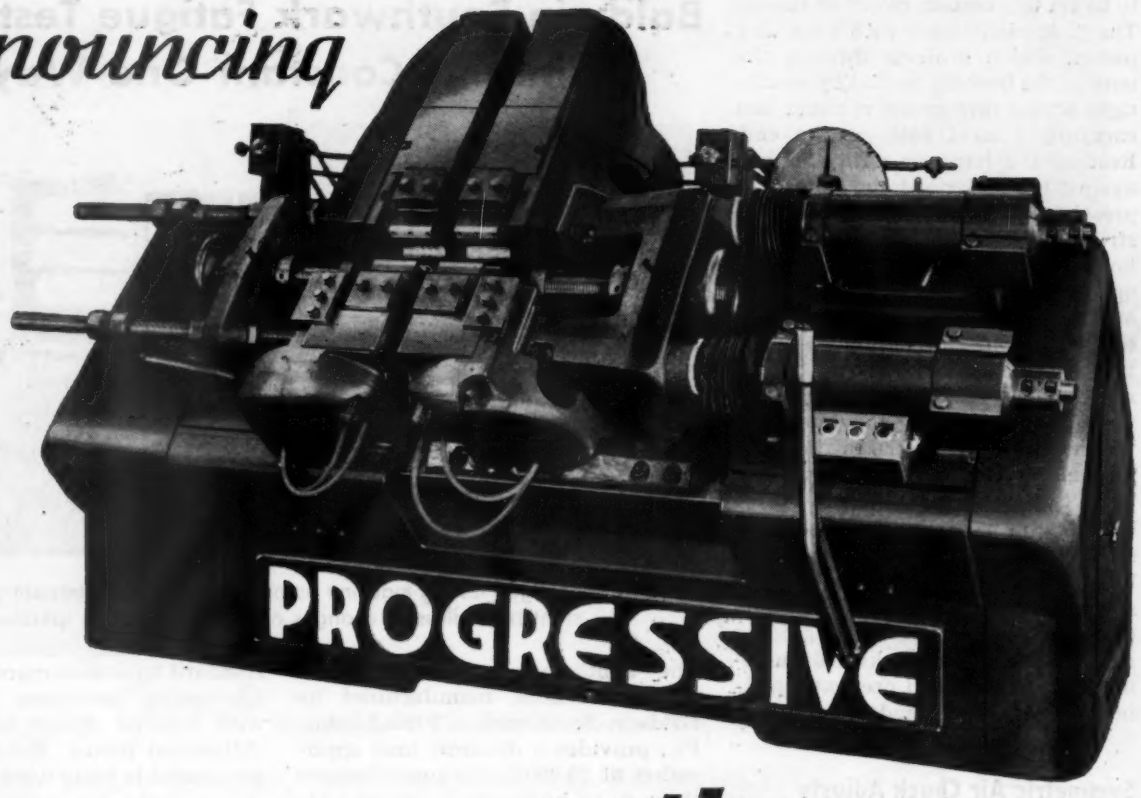
An instrument that makes practical the taking of a hardness test right where the material is, in the shop, yard or on the truck, instead of taking a specimen to a testing machine, is announced by Steel City Testing Laboratory, 8843 Livernois, Detroit 4, Mich., and it is identified as a portable hardness testing hammer, type P. The usual method of checking for hardness is by means of fixed test-machinery, using especially prepared test pieces. In many instances, it is not necessary to obtain a scientifically accurate test of the material, but it is sufficient to know the hardness in regard to workability. With this self-acting hammer, it can be done quickly, employing any unskilled labor. Repeated tests can be made without readjusting the hammer.

Steel City hardness testing hammer is durable and easily manipulated

If material of a certain degree of hardness is to be selected, it is only necessary to see whether the diameter of the impression made corresponds to the desired degree of hardness. If the impression is smaller or larger, the specimen is either too hard or too soft, which can be checked with microscope and chart supplied.

The hammer consists of a cylindrical housing and piston; the housing is closed on one end with an inside thread cover, and on the other end with an open bushing. Between the cover and the piston, a strong spring is located which presses the piston against the bushing. The tension of the spring can be adjusted by turning the cover, if the hammer is

Announcing



the POST-WAR FLASH WELDER

These new standard PROGRESSIVE flash welders are not "improved models". They are designed to surpass anything previously built in the way of flexibility, ease of operation, reliability, simplicity of control and ease of maintenance.

Here are a few of their features which spell lower over-all production costs for you:

- Completely self-contained—no accessories needed
- Inclined or flat top (optional)—easy loading—faster output
- Heavy platen designed for interchangeable fixtures
- Simple controls—fewer adjustments—cuts set-up time
- Hydraulic operation—no mechanical linkages to adjust
- Standardized enclosed operating units—"unit-removable" for service
- Standardized dies—quick replaceable
- Rigid one piece steel frame
- Slide rail platen—bearings outside of flash zone.

We will be glad to send you preliminary bulletin #203 giving further details. Please state maximum size of work and materials being welded or to be welded.

IT PAYS TO WELD

PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

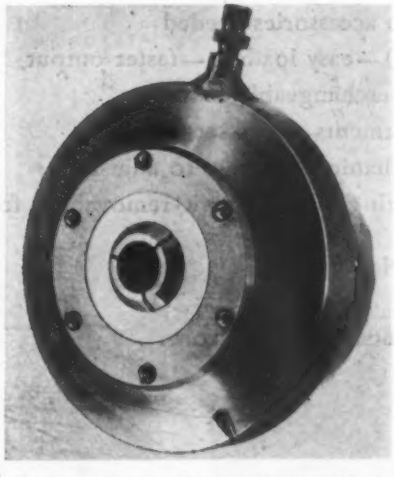
RESISTANCE WELDING EQUIPMENT

to be set to a certain power of stroke. The piston is coupled with a striking piston, which projects through the bore of the bushing guided by an air-tight fitting ring in the cylinder and carrying a steel ball on the end. Resting the hammer with the ball against the material to be tested and pressing on the operating end, the striking piston and the piston in the housing moves inward and presses against the spring between the piston and the cover. At a certain point, in this movement, the coupling between the piston and the striking bolt is released, so that the piston, under pressure of the spring, moves against the inner end of the striking bolt and the ball striking against the material to be tested.

After the hammer is released, the striking bolt or piston is brought back to its former position by a spring in the cylinder. The cushion of compressed air before the guiding ring causes a slow backward movement of the ball, and prevents spoiling the impression made.

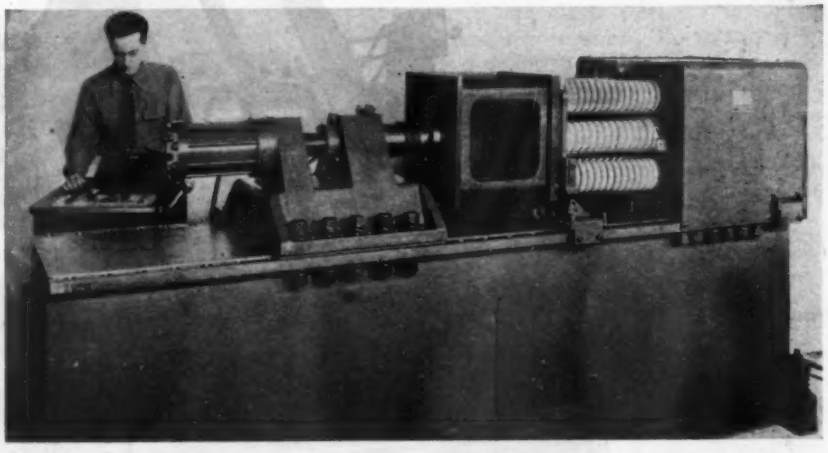
Symmetric Air Chuck Adjusts Automatically to Variations

An air-powered collet chuck that automatically compensates for variations in stock size up to 1/32 in., is manufactured by the Symmetric Manufacturing Co., 147 W. Alameda, Burbank, Calif. The air chuck is controlled by a foot valve. Collets can be interchanged without adjustment or removal of the chuck head from the machine. A pressure regulator is provided to control clamping pressure and an adapter plate permits adjustments in installation to assure concentricity on any machine.



Symmetric air chuck adapter plate permits adjustment to full concentricity with any machine center

Baldwin Southwark Fatigue Tester Maintains Constant One-Way Load



Southwark fatigue testing machine automatically keeps alternating loads constant regardless of changes of deflection in the specimen

The Southwark universal fatigue testing machine, manufactured by Baldwin-Southwark, Philadelphia, Pa., provides a dynamic load application of 20,000 lb. in one direction through an hydraulic preloading attachment of 10,000 lb. capacity. The high operating speed of approximately 2,000 load cycles per min., at constant force as opposed to constant deflection, are two important advantages.

Any predetermined alternating load is kept automatically constant regardless of the changes of deflection that may occur in the specimen under test.

Accessory tools for testing various sizes and shapes of specimens in tension or compression, bending or torsion, are available. The standard distance between plates is 4 ft., but the machine can be adjusted for longer specimens.

The dynamic load is produced by a centrifugal force type oscillator, the force of which is amplified by working near resonance of the system. The load is measured and controlled electronically. The maximum alternating force is plus and minus 10,000 lb., which may be applied in increments of 10 lb.

Southwark's other universal fatigue testing machine of 1,000 lb. alternating force capacity also has a static preloading attachment which results in a force capacity of 2,000 lb. in one direction. It was developed for tests in tension-compression, bending or torsion.

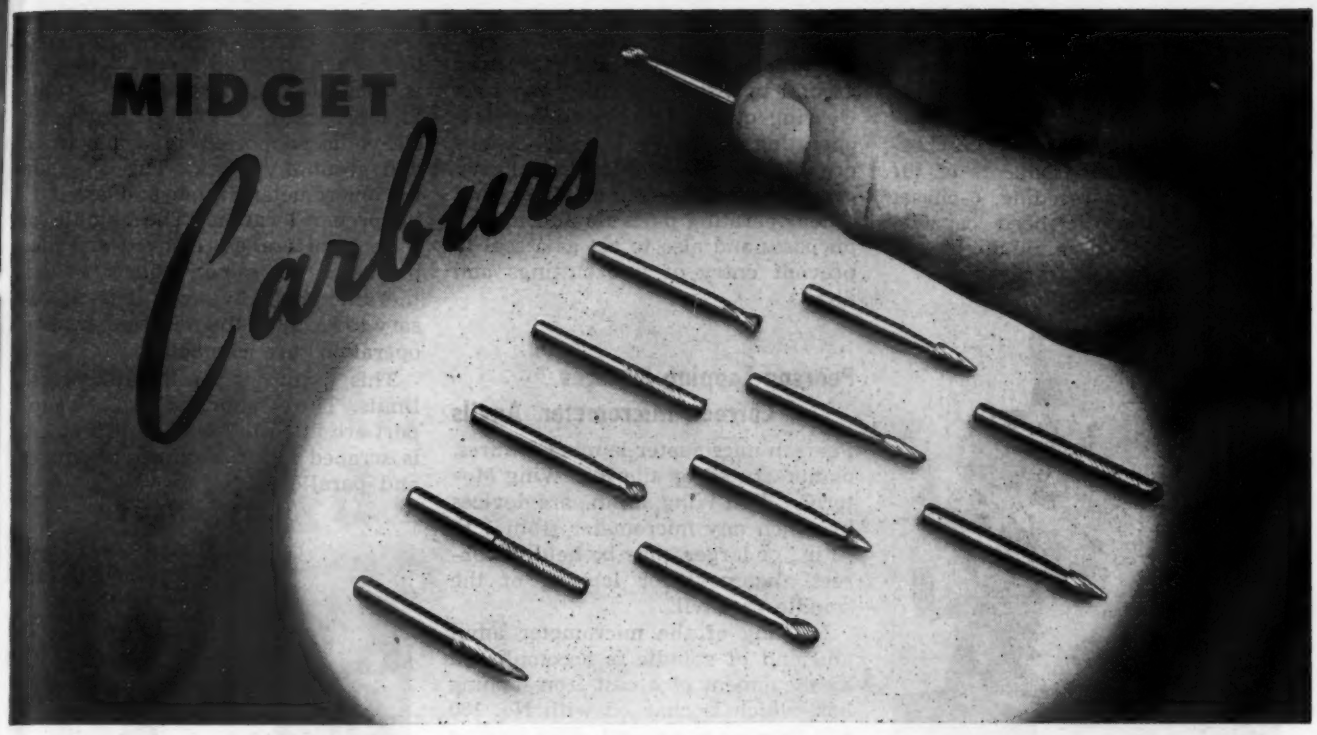
The torsion testing attachments for the latter have a capacity up to 30,000 in. lb. and permit the testing of specimens exceeding 1 in. dia. The standard tension-compression fixture for testing specimens is equipped with tapered collets to grip plain cylindrical pieces. Bending fixtures are available up to 6,000 in. lb. bending moment for testing flat plate specimens up to approximately ⅜ in. in steel, ½ in. in aluminum alloys and 1 in. in plastics.

As in the other machine, this 1,000 lb. tester operates at high speed and may be set for any predetermined alternating load which is then automatically kept constant. An inertia force compensator cancels all inertia forces, and the accuracy of loads transmitted is kept within plus or minus two percent. The entire mechanism of the machine, including the large T-slotted work table attached for use in testing assemblies, structural components or parts, is seismically suspended in the frame to eliminate the transmission of vibration to the floor.

Airco Transformer Welder Provides Two Current Ranges

A 200 ampere Wilson Bumblebee transformer welder has been announced by Air Reduction, 60 E. 42 St., New York 17, N. Y. Built-in capacitators reduce power input. The 200 amp. Bumblebee has two ranges of current, the low range from 30 to 110 amp. and high range from 90 to 275 amp. Continuous stepless current control is provided throughout each current range.

The machine is self-contained and sturdily constructed. All windings are covered with spun-glass fibre, heat-resistant Class B insulation.



Industry's First SMALL CEMENTED-CARBIDE ROTARY FILES FOR TOOL ROOM, DIE SHOP AND PRODUCTION DEPT. USE.

Carburs, in extremely small sizes, are now available for application where small, mounted grinding wheels have ordinarily been used.

These new, small cemented-carbide rotary files offer many advantages not provided by grinding wheels. Their life, in many cases, is more than 100 times that of a wheel. Their form does not break down. They will cut faster in any material—including hardened die steel—on which grinding wheels might be used. They can be used in places where a wheel will not go, and are much better for holding sharp corners.

Midget Carburs are of solid cemented-carbide with heads as small as ⅛" diameter. Practically any desired shape can be furnished. As they are produced as special tools, prices are quoted on the basis of specific requirements.

Carburs in larger sizes are available in a wide range of standard shapes and sizes. Write for descriptive booklet.

FOR JOBS LIKE THIS

A prominent gear company formerly used a minimum of eight mounted grinding wheels to burr one ring gear. These gears have a C-63 Rockwell hardness. Today, using midget Carburs, at least eight gears are completely burred with one tool.

In other instances, and especially on die work, these tools have demonstrated a service life much greater than shown in this particular example.

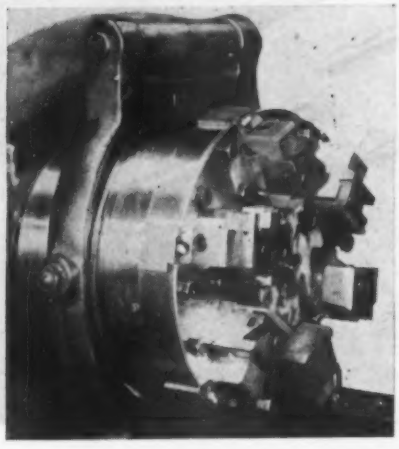
LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1721 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

Lanco Six-Chaser Die Head Has Semi-Receding Die Action

The Landis Machine Co., Waynesboro, Pa., are the producers of the Lanco 5 in. semi-receding, 6-chaser die head. The die head capacity ranges from 2½ in. minimum to 4 in.



Lanco heads are designed to operate as internally tripped units but can be opened and closed externally by means of an operating yoke

maximum. The chaser holder slides are gibbed to the head body to provide compensation for wear. The interlocking design of the holder and slide assures a rigid clamping action of the two mating parts, with only one clamping screw.

The Lanco 6-chaser semi-receding die head employs the Lanrac chaser, which provides an accurate and rapid method of interchanging and setting the chasers. This head is of the internal tripped type, in which a 6 blade, inserted blade reamer, located within the bore of the head, reams and chamfers the pipe during the threading operation and opens the head at any pre-determined thread length. The semi-receding action on the head eliminates the possibility of any chaser leave-off marks on the thread as the head opens up. The reamer is adjustable by an adjusting and clamping rod which extends through the machine spindle. Any desired thread length can be obtained by releasing the locking rod and turning the adjusting rod right-hand or left-hand to increase or decrease the thread length. Any thread length within the thread length standards for 2½ to 4 in. pipe sizes is obtainable.

All parts of the 6-chaser head are made from either high carbon or special alloy steel, depending upon their function, and are heat treated or case carburized and precision ground to assure accuracy and long wearing quality. The head has few operating parts. Zerk type fittings provide a means of forcing heavy grease into the chaser slides and other operating parts for lubricating purposes and also to act as a seal to prevent entry of fine cuttings and dirt.

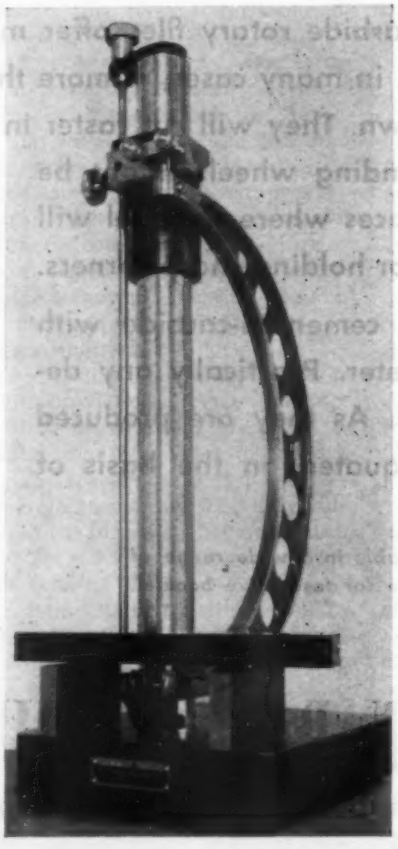
Pearson Lapping Fixtures Correct Micrometer Anvils

Pearson micrometer lapping fixtures, manufactured by the Red Wing Motor Co., Red Wing, Minn., are devices in which any micrometer from 1 to 18 in., or larger, may be held in correct alignment for lapping of the spindle or anvil.

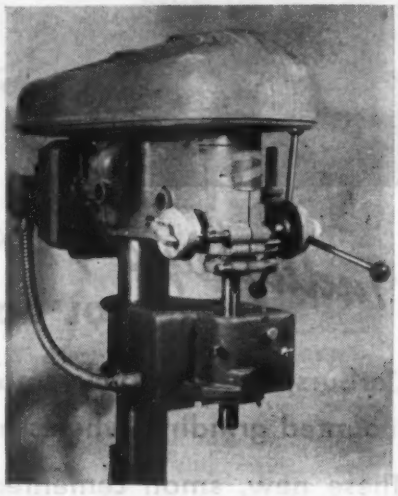
Lapping of the micrometer anvil and end of spindle is accomplished by movement of a cast iron lapping bar, which is charged with No. 180 grit lapping compound. The lapping compound does not reach the two parallels, but only at the point being lapped, a surface about two inches in length by the width of the bar, which is 1½ in. When the bar is worn out of true, it is surface ground to bring it back to condition.

The lower support is floating, so that when the feed screw at the top is used the anvil raises up to the lapping bar. The micrometer sleeve is supported in a hardened and ground V-block. This lines up the micrometer frame and anvil to its proper location. The spindle of the micrometer is removed and also placed in the same V-block. When the anvil is badly worn it is necessary to readjust the micrometer after operations are completed.

This fixture is machined to close limits. The column and V-block support are fitted to 0.0001 in. The table is scraped and the fixture is square and parallel.



Pearson micrometer lapping fixture can be used for end measuring rods



Rotorex precision tapping attachment is provided with lead control and automatic emergency reverse

Rotorex Tapping Attachment Produces Class 3 Threads

A Rotorex precision tapping attachment, which is applicable to all popular model drill presses and produces Class 3 threads in 0-80 to ⅞ in. sizes, is announced by the Douglas Machinery Co., 150 Broadway, New York 7, N.Y.

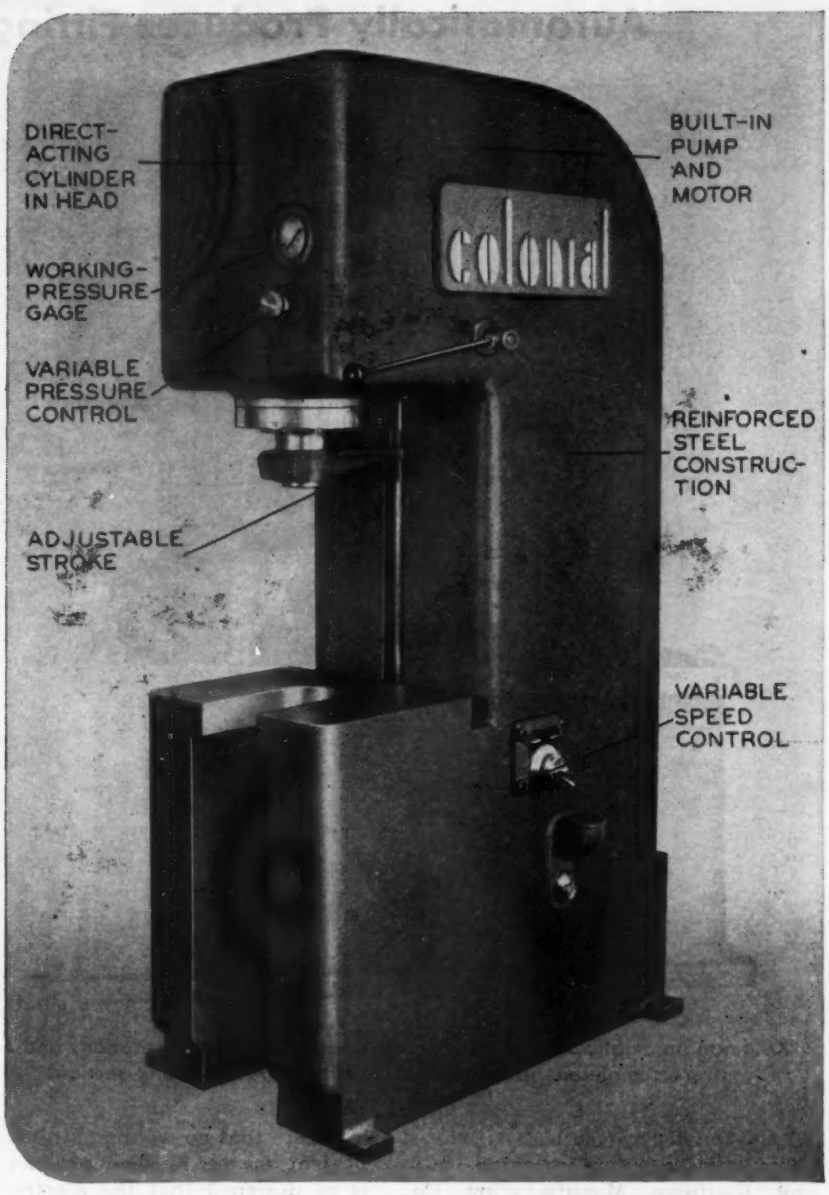
It provides positive, automatic control of lead to assure precision tapping, as well as accurate control of depth to a tolerance of 0.010 in. Lead screws are hardened and precision ground, lubricated, and fully enclosed for protection from dirt. Other features include instantaneous emergency reverse, complete automatic cycle, and foot control which leaves operator's hands free for loading.

Changeover from tapping to drilling or vice-versa can be made in 5 minutes. The attachment requires little more vertical space than a tapping chuck, and is simple in construction and operation.

ANNOUNCING-----

Colonial

Hydraulic Standard ASSEMBLY PRESSES



Companions to Colonial's line of standard Broaching Presses and Straightening Presses, these ultra-modern all-hydraulic units are characterized by exceptionally smooth yet powerful action, due to use of the exclusive Colonial hydraulic pressure system, with direct acting cylinder built into the machine head, etc.

Capacities: 15, 20, 35, and 50 tons.

Stroke: Adjustable, 12 in. maximum.

Speed: Adjustable, 60 to 180 inches per min. max. on working stroke, 120 to 360 inches per min. on return stroke (depending on machine size).

Pressure: Infinitely variable, External adjustment. Pressure gage indicates exact pressure. Max. Press. 1000 to 1500 lbs. per sq. inch depending on size.

Floor Space: Only 29 x 50 inches on largest model.

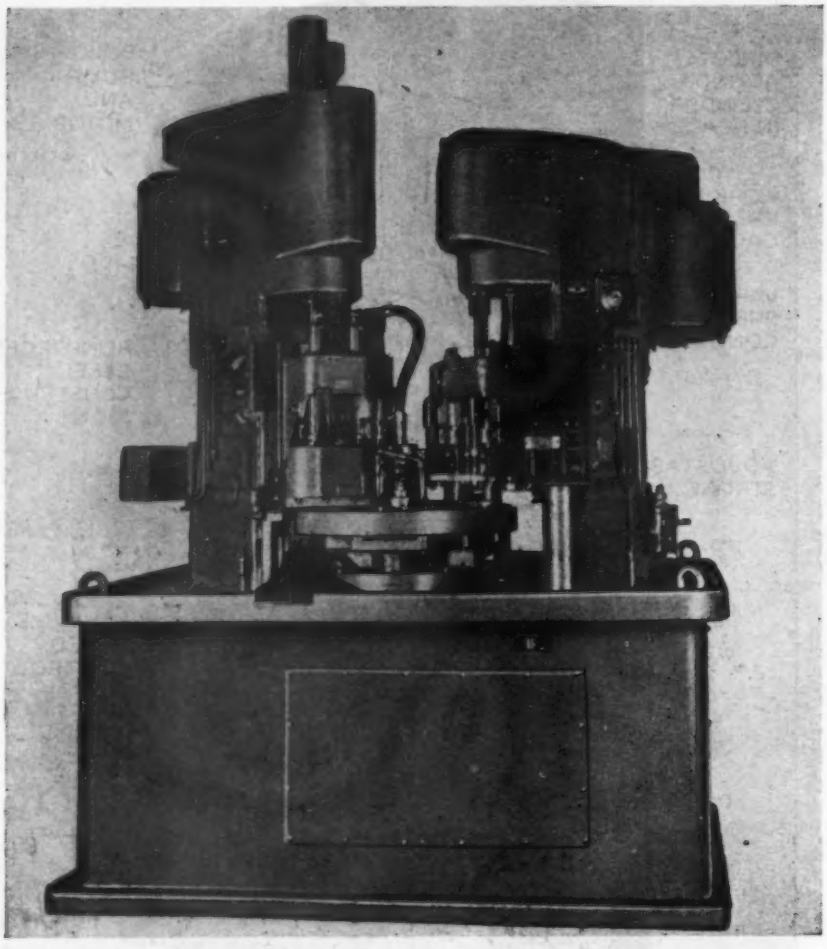
For Complete Details, ask for Bulletin PA-45.

colonial BROACH COMPANY

DETROIT 13, U.S.A.

Broaches — Broaching Machines - Broaching Equipment

Six-Spindle Kaufman Processor Automatically Produces Fittings



Kaufman automatic processor for conduit parts finishes all operations and delivers completed parts manufactured from rough blank sections

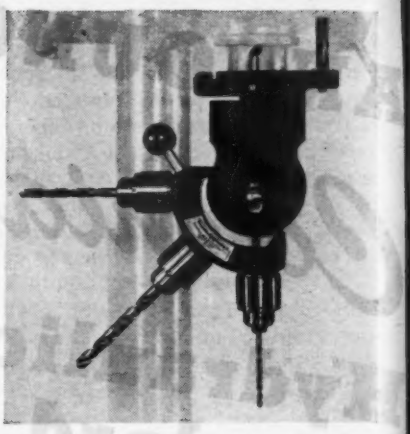
A six-spindle hydraulically operated automatic indexing machine, built by Kaufman Manufacturing Co., Manitowoc, Wis., is tooled to step-ream and thread malleable-iron thin wall conduit connectors and nuts. All operations are fully automatic, hydraulically performed and electrically controlled. The reaming head has a range of speeds—rapid advance, feed, dwell and rapid retraction. The threading head is equipped with a lead screw that can be changed to fit the pitch of thread to be cut.

The electric motor equipment consists of two 5 hp. motors mounted on Reeves variable speed drives; one 5 hp. motor to drive the hydraulic pumps and one 2 hp. self contained centrifugal coolant pump. The machine is approximately 96 in. high by 78 in. long by 60 in. wide.

The base is of welded steel, normalized as a unit and then machined to assure that no welding strains are present in the finished product. It is so designed that the electrically controlled panel, the hydraulic reservoir, the coolant pump, and the chip depository are integral.

Universal Drill Press Turret Runs in Pre-Loaded Bearings

Universal Engineering Co., San Diego 2, Calif., are the manufacturers of a drill press turret head incorporating semi-automatic, single-action indexing of the quadrant. Automatic engagement or release of the clutch mechanism is controlled by the raising or lowering of the drill press feed lever. Thrust and radial load is carried through pre-loaded sealed ball-bearings. Load is carried directly by the turret head itself and is not transmitted to the drill press spindle.



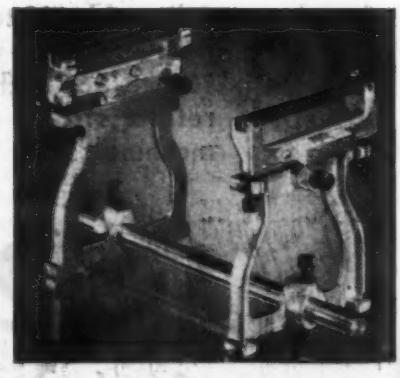
Indexing control of the Universal turret head is semi-automatic

With the drill press in the raised position, the operator shifts the quadrant lever on the turret, thereby selecting the next operation. Only the driven spindle (the one in operation at the time), is in motion. The other spindles remain idle. Shifting action involves but one-moving part.

All parts of Universal's turret head are interchangeable and manufactured in sizes to fit any standard drill press; whether equipped with Morse taper or Jacobs chuck spindles. The turret itself has Jacobs chucks as standard equipment on all models and sizes. Normal stroke of the drill press is reduced ½ in.

Gelber Static Balancing Stand Levels with Integral Adjuster

A precision built static balancer is offered by S. Gelber, 34 S. Jefferson St., Chicago 6, Ill. The 9 in. model has a finger tip span adjustment up to 9½ in. It is set up on any fairly level support. Balancing surfaces have built-in spirit level and fine adjustment screws. These permit compensation for high spots or low spots



Gelber static balancing stand weighs 2 lb. and is easily portable

Molybdenum in steel combines full hardening with freedom from temper brittleness to produce optimum low temperature impact strength.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

in the bench or supporting surface.

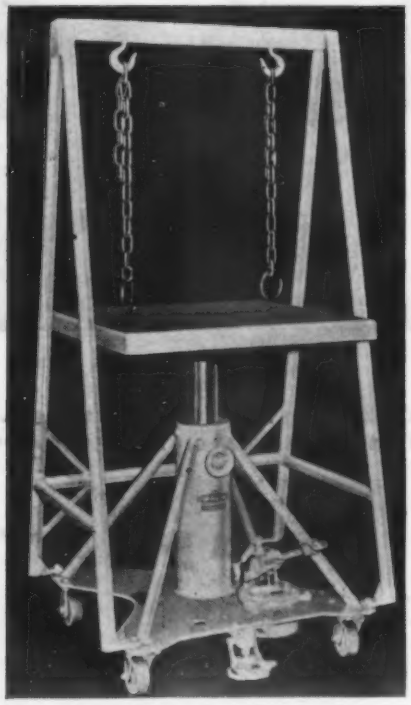
The balancing surfaces are deep hardened with ground ways. Swing capacity is 9 in., the supporting capacity is 50 lb. Two larger models are available with 20 and 30 in. spans.

Lyon-Raymond Die Separator Increases Utility of Die Table

Lyon-Raymond Corporation, 2266 Madison St., Greene, N.Y., announce an optional feature for their portable hydraulic elevating table. This die separator consists of a tubular superstructure which fastens to the base of the table by four bolts with wing nuts.

Dies are separated by elevating the table top, fastening the top section of the die to the superstructure by means of the chains, then lowering the table top with the bottom section of the die.

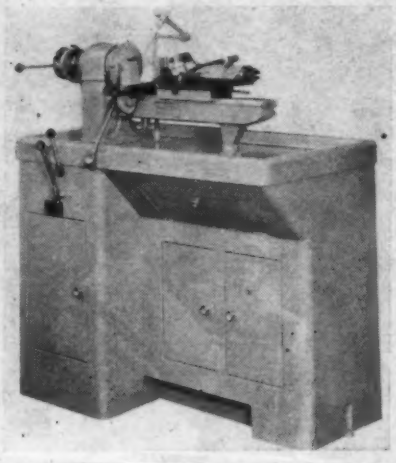
Being demountable, the die separator does not limit the use of the table, which may be made available for such work as the transferring of dies in and out of presses, the support of overhanging materials, an adjustable height assembly bench, and other handling and work positioning tasks for which it was designed. The structure of the separator is designed to hold any weight that can be lifted by the table.



Lyon-Raymond die separator can be removed, increasing uses for the hydraulic elevating table

Wade Screw Machine Cabinet Contains Six-Speed Drive

A steel cabinet and lathe drive has been developed by the Wade Tool Co., 49-59 River St., Waltham 54, Mass., on which may be mounted either the No. 7, 1 in. collet capacity, the No. 5, ¾ in. collet capacity screw machine or standard lathe. The drive, with one shaft between the motor and the spindle, gives



Wade screw machine cabinet has ample space for usual accessories

ratio of 4 to 1 for tapping, reaming and dieing operations. A range of speeds in geometric progression are provided to give 6 speeds from 320 to 3300 r.p.m., with a single speed motor, or 12 speeds from 155 to 3300 r.p.m. with a 2 speed motor. The design of the cabinet allows operation from either a standing or sitting position. It is constructed of heavy sheet metal and welded throughout to assure rigidity.

Cimcool Combines with Water To Form Cutting Emulsion

Cimcool, a product of Cincinnati Milling and Grinding Machine, Inc., Cincinnati 9, Ohio, is a chemical emulsion which is diluted with water to form a combination coolant and lubricant for grinding and cutting operations. The ingredients of Cimcool are a chemical powder and a liquid; both are inhibitive to bacterial growth and are not irritating to the skin.

For its anti-friction properties, the chemicals, which meet the active raw material surface as each chip is created, react to form low shear-strength compounds at the chip-tool interface. For its cooling quality, Cimcool has ingredients which absorb heat by physical change. This combination of friction reduction and high heat absorption capacity in the same liquid serves to keep temperatures low by lessening heat generation and by rapidly dissipating what heat is created.

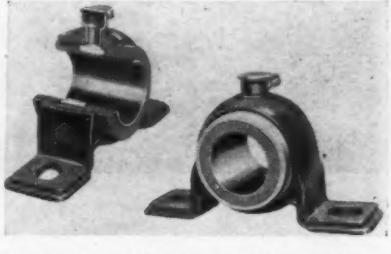
The character of the emulsion is such that grit and chip fragments do not readily suspend in the emulsion and thus are not recirculated to the surfaces being machined.

Cimcool is diluted, for grinding, 1 part to 100 parts of water, and for general cutting operations, from 1 part in 10, to 1 part in 40 parts of water, depending on the demands of the operation. The material is non-corrosive and rust inhibitive.

Bronzoil Fanshaft Bearings Reduce Blower Resistance

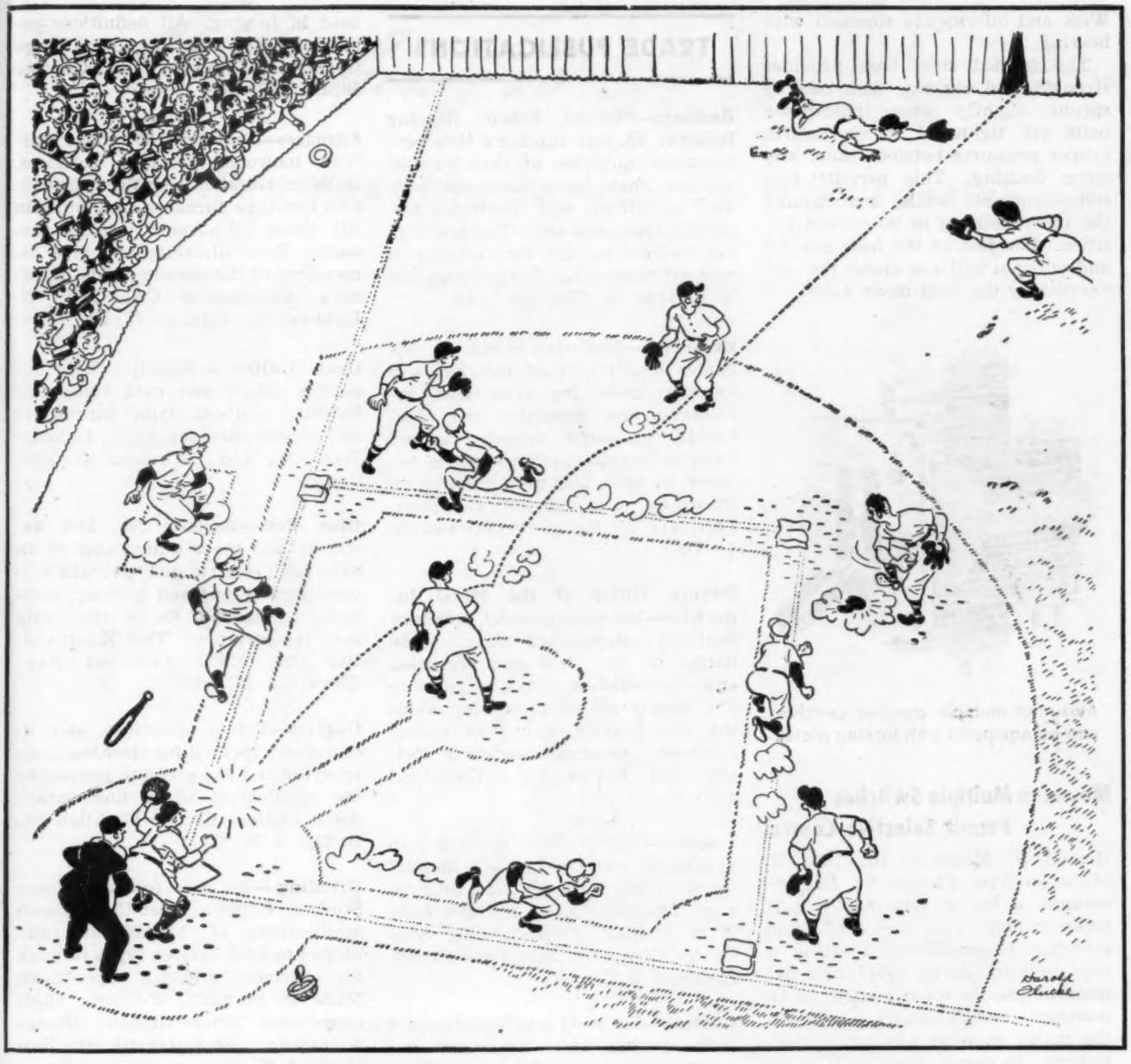
A bronze bushed bearing for small shafts especially adapted for fan and blower service, known as the Type "F" Bronzoil bearing, has been announced by the Dodge Manufacturing Corp., Mishawaka, Ind. This bearing is fully self-aligning. The inner housing is spherical to conform to a spherical socket in the formed steel outer housing which permits free self-alignment and avoids cramping the shaft.

A bronze capillary bushing, which carries about one-third of its volume of lubricant, is used as a liner. This bushing is provided with a shoulder which offers a broad, flat bronze bearing surface which is always lubricated and serves to reduce friction between the bearing and the



Bronzoil bearings can be sound-isolated with Neoprene grommets

collar which positions the shaft. The bearing is compact. The frontal area, which measures the obstruction to air flow, has been reduced, which results in greater volumetric efficiency of the blower. The provision for lubrication is simple and adequate. A liberal oil reservoir with a close fitting wick surrounds the bronze capillary bushing and supplies the required amount of oil as needed.



Nothing Rolls Like a Ball . . .

. . . and Pipsqueak O'Shay has just applied that principle in a manner which wins ball games!

That same fundamental fact—"Nothing Rolls Like a Ball"—is the difference between *ball* bearings and any other type bearing. Throughout war and industry, New Departure Ball Bearings are proving their unique fitness for our new world of higher speeds and heavier loads.

For the simple device of carrying the loads on a circle of tough steel *balls*, rolling freely in precision-ground raceways, has been the answer to many a 64 Million Dollar Question.

We believe no other bearing has as many—and varied—advantages as the *ball* bearing. Particularly the ball bearing backed by the technical skill and the wide experience of New Departure. 3377

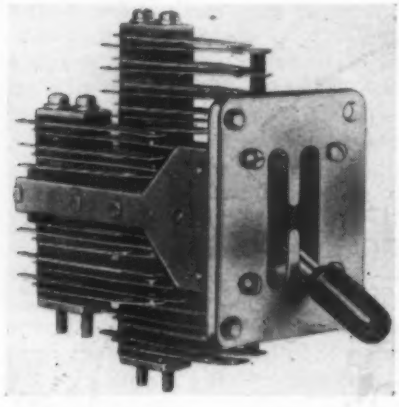
There is more for you in a New Departure ball bearing than steel and precision. Advanced engineering and a desire to serve are tangible plus values.

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN. • Branches in DETROIT • CHICAGO • LOS ANGELES and Other Principal Cities

Wick and oil cup are supplied with bearing.

The formed steel base provides strength and rigidity. The base is sprung slightly when hold-down bolts are tightened which insures proper pressures between inner and outer housing. This permits free self-alignment while maintaining the inner housing in its correct position. The feet of the base are flat and will not collapse under the pull exerted by the hold-down bolts.



Mossman multiple position switches can be equipped with locking plates

Mossman Multiple Switches Permit Selective Control

Donald P. Mossman Inc., 612 N. Michigan Ave., Chicago 11, Ill., announces a Series 4500 heavy duty lever switch. This series of lever switches is available in either a four position (Series 4504), or a five position (Series 4505) switch. In all positions, except center (neutral), the action may be locking or non-locking. In center position it is always locking.

Locking or non-locking action is obtained by using removable stop plates underneath the escutcheon plate which is a part of the unit. The action may be changed at any time by selecting the proper stop plate.

The Series 4500 heavy duty lever switch is useful for safety selective switching, substituting the use of four switches where selectivity is required, preventing the danger of throwing more than one switch at a time, and emergency transfer of spare equipment, in which the special locking arrangement prevents using the switch without breaking a seal. Various applications such as motor starting, stopping, reversing and speed control, hoist and crane control, equalization of multi-generator operation and others are possible.

TRADE PUBLICATIONS

Bearings—Molded Fabric Bearing Bulletin, 68-page brochure lists performance qualities of this type of bearing, their advantages and service conditions, and illustrates numerous types and sizes. The bearings are molded to size for installation without machining. Gatke Corp., 228 N. LaSalle St., Chicago 1, Ill.

Broaching—Bulletin 20,000 B includes illustration of internal and external broaching operations, information on manually and electrically operated broach support troughs, increased return speeds, revised weights and new installation drawings. The Oilgear Company, 1301-1417 W. Bruce St., Milwaukee 4, Wis.

Buyers' Guide of the Metal Industries—108-page product directory contains engineering data, trade names of tool steel and corrosion and heat-resisting alloys, magnesium and copper alloys, fluxes for welding and brazing, names of manufacturers. American Society of Metals, 7301 Euclid Ave., Cleveland 3, O.

Centers—Folder about positive stop headstock center presents a method for centering work against a positive stop. The center has a spring to hold it in position. Compensating Stop Center Company, 2074 Park Street, Hartford 5, Conn.

Coating—Fuzon-O is a flexible vinyl resin coating, used for water and moisture resistant fabric coatings, shoe materials, glass cloth, cast or unsupported films in clear, solid colors or multicolor combinations. It can be used to impregnate fabrics. Stanley Chemical Co., 1938 Bearings Ave., E. Berlin, Conn.

Equipment—Catalog No. 42 shows many types of lift trucks, skid platforms, fork trucks, stackers, cranes, wagons and hand trucks for material handling. Lewis-Shepard Products, Inc., 300 Walnut St., Watertown, Mass.

Floors—Folder describes Tufcrete resurfacer to be used on worn out floors; it is fire-resisting, durable and safe; does not dust. Tufcrete Co., 625 S. 9th St., Des Moines 9, Iowa.

Forging—Booklet "Glossary of Forging Terms" is a definition of terms used in forging. All definitions relate to forging practice. Kropp Forge Co., 5301 W. Roosevelt Rd., Chicago 50, Ill.

Furnaces—Bulletin 160 about gas-fired toolroom box-type furnaces, Bulletin 170 about gas-fired production box-type furnaces, and Bulletin 201 about all-purpose brazing furnaces. They illustrate and give dimensions of the various kinds. Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill.

Gear Cutters—Bulletin E45 describes rotary and rack type gear finishing cutters, laps, burnishers and master checking gears. Colonial Tool Co., Ltd., Windsor, Ontario, Canada.

Glue Pots—Bulletin No. B-4 describes and gives dimensions of an automatic electric glue pot which is permanently wet and is thermostatically controlled for a uniformly low temperature. The Kindt-Collins Co., 12651 Elmwood Ave., Cleveland 11, Ohio

Goggles—Folder describes and illustrates a method for cleaning, sanispraying and fog-proofing goggles by the application of a fine spray. Allen Optical Co., 15-17 Allen St., Buffalo 2, N. Y.

Grinding—8-page folder "Speed Surface Grinding Set-Ups" shows applications of Magna-Blox employed to hold various types of work for surface grinding operations. Made in parallels, V-blocks, angle irons and other shapes. George Scherr Co., 200 Lafayette St., New York 12, N. Y.

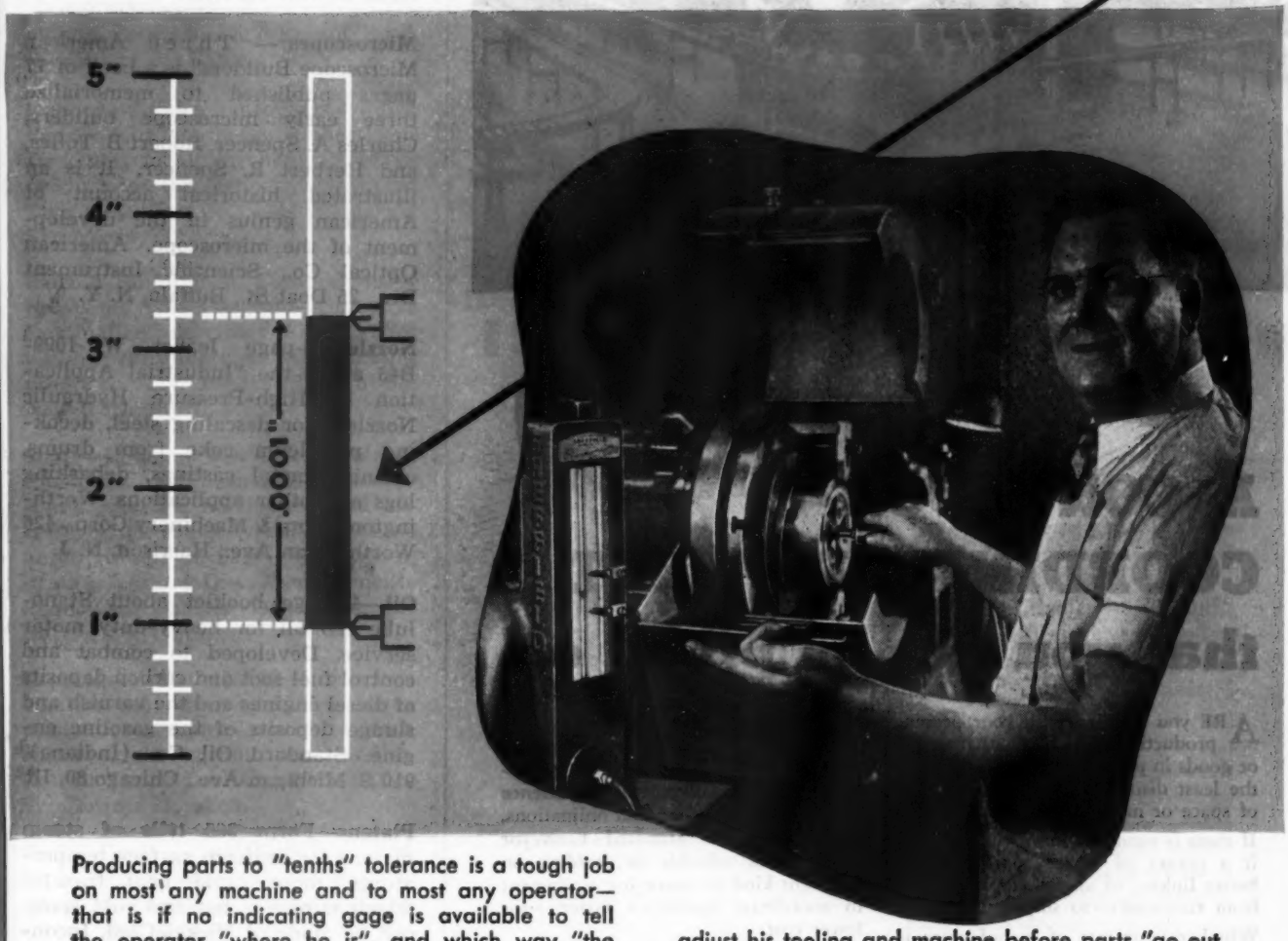
Helicopters—An illustrated catalog shows many uses and answers to questions about the design, cost, performance, and stability of the machine. The Bell Aircraft Corp., 2050 Elmwood Ave., Buffalo 7, N. Y.

Instruments—Bulletin DM006 illustrates a wide variety of instruments for recording pressure, vacuum, draft, humidity, temperature, liquid levels and other methods of controlling conditions. The Bristol Co., 117 Bristol Road, Waterbury 91, Conn.

Joints—Folder describes and gives dimensions of ten sizes of universal joints capable of a maximum angle of 45 deg. on each side of the center line for each size. Shanks are blank so that the manufacturer may finish

Checking to "TENTHS"

can be like reading inches on a yardstick



Producing parts to "tenths" tolerance is a tough job on most any machine and to most any operator—that is if no indicating gage is available to tell the operator "where he is", and which way "the machine is going."

With a Precisionaire to use right at the machine on which the operator can read "tenths" as he would read inches on a yardstick, he can see "where he is". Working to "tenths" becomes as easy as working to "thousandths". And most important of all, he knows that every piece accepted on the Precisionaire is "right".

Scrap is reduced to a few incorrect pieces possibly made during the machine setup—no additional scrap need result as the Precisionaire tells the operator to adjust his tooling and machine before parts "go out of tolerance".

The Precisionaire checks internal or external dimensions with equal accuracy. It is available in four models of different amplifications for tolerances ranging downward from .005" to fractions of a "tenth". Hundreds of Model No. 600-0 are being used in various plants right at the machine to check to plus or minus five millionths of an inch. Thousands of lower amplification models are used daily in receiving, process and final inspection in the nation's production plants.

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SHEFFIELD MASTER CRAFTSMEN

Dayton 1, Ohio, U.S.A.

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A CONVEYOR-COORDINATED PLANT that you can be proud of!

ARE you satisfied with your present production plant? Does material or goods in process flow smoothly with the least disorder, loss of time, waste of space or man-power?

If there is room for improvement, isn't it a matter of better coordination—better linking of all the steps involved from receiving — to shipping?

Whether your rate of manufacture is several hundreds a minute or one an hour, Standard builds conveying equipment to meet the situation.

The range and versatility of Standard Conveyor equipment are the result of nearly 40 years of close contact with inside-the-plant transportation — in plants large and small, making products as widely diverse as steel or cosmetics. The benefit of this experience is available to you, without obligations. The counsel of Standard Conveyor engineers is valuable in deciding on the right kind of conveying equipment to coordinate operations faster — for lower cost.

Write for comprehensive reference book—"Conveyors by Standard"—Catalog No. AM-85

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to his own dimensions. Made of heat-treated alloy steel. The Gray & Prior Machine Co., 125 Suffield St., Hartford, Conn.

Marking — 8-page catalog covers hand and machine marking devices to cover virtually all stamping and identification operations occurring in manufacturing plants. New Method Steel Stamps, Inc., 147 Jos. Campau Ave., Detroit 11, Mich.

Microscopes — "Three American Microscope Builders" is a book of 77 pages published to memorialize three early microscope builders, Charles A. Spencer, Robert B. Tolles, and Herbert R. Spencer. It is an illustrated historical account of American genius in the development of the microscope. American Optical Co., Scientific Instrument Div., 25 Doat St., Buffalo, N. Y.

Nozzles—8-page leaflet WP-1099-B43 about the "Industrial Application of High-Pressure Hydraulic Nozzles" for descaling steel, decoking petroleum coke from drums, cleaning metal castings, debarking logs and other applications. Worthington Pump & Machinery Corp., 426 Worthington Ave., Harrison, N. J.

Oil—42-page booklet about Stanolube HD oil for heavy-duty motor service. Developed to combat and control fuel soot and carbon deposits of diesel engines and the varnish and sludge deposits of the gasoline engine. Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.

Platens—Form 265 tells of steam platens for uniform surface temperatures, more rapid heat transfer which minimize hot and cold spots; can be made of Nickel-Clad, Inconel-Clad, Monel-Clad and Stainless-Clad Steels for corrosion resistance and high polish. Also can be had with unusually hard surfaces. Lukens Steel Co., 265 Lukens Bldg., 1943 Gillen St., Coatesville, Pa.

Public Relations—Booklet about the activities of an organization of a small group of professional men in a comparatively new profession with responsibility to clients, public, channels of distribution and the profession itself. National Association of Public Relations Counsel, Inc., International Bldg., Rockefeller Center, New York 20, N. Y.

Pumps—Bulletin W-487-B11 power-driven steam-jacketed rotary pumps for melted materials or highly viscous liquids requiring pre-heating to maintain their fluidity. Can be sup-

plied with any drive desired. There is a tabulation of displacement and dimensions for nine sizes of pumps. Worthington Pump & Machinery Corp., 426 Worthington Ave., Harrison, N. J.

Recorder—Bulletin OP1502 describes a machine running time recorder, gives information about the principle of operation and method of use, includes typical chart records. The Bristol Company, 117 Bristol Road, Waterbury 91, Conn.

Rubber—Catalog provides quick facts about synthetic rubber constructions in all mechanical rubber products of the company. Goodyear Tire & Rubber Co., 1144 S. Market St., Akron, O.

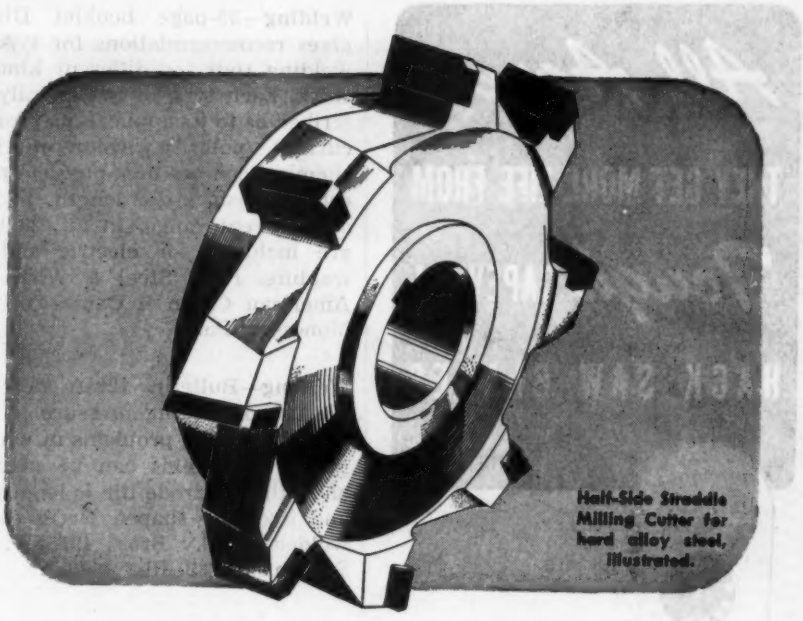
Sales—"Building a Comprehensive Point of Sale Program—Objective Domination" describes a method for building an integrated point of sales program. Kay, Inc., 9 E. 40th St., New York 18, N. Y.

Shaft—48-page Kellerflex catalog illustrates and describes flexible shafts, sheaths, handpieces and accessories for many types of machine units. Kellerflex Sales Department, Pratt & Whitney Div., Niles-Bement-Pond Co., Charter Oak Park, W. Hartford 1, Conn.

Tapping—Bulletin MTM-45 describes medium-duty, high-precision, high-production tapping machines with either single or multiple spindles. Detroit Tap & Tool Co., 8432 Butler St., Detroit 11, Mich.

Tools—Catalog and Handbook No. 33 is a complete book about precision measuring instruments of the optical flat type which do not require gage blocks. It also shows light wave micrometers, master blocks in sets, plug gages, cylindrical standards and measuring wires. Numerous tables are for measuring threads, gears and splines by wires. The Van Keuren Co., 180 Waltham St., Watertown, Mass.

Vise—Multi-swivel vise which can be used as a plain vise, a vise to swivel horizontally, or as a vise to swivel in three directions, a full circle about the cradle, tilted to 90 deg. in a vertical plane and the whole assembly swiveled a full circle about the base. A platen can be mounted on the unit instead of the vise. A table gives dimensions and prices for three sizes of vises. All movements are fully graduated. Master Tool Co., 161 High St., Boston, Mass.


Half-Side Straddle Milling Cutter for hard alloy steel, illustrated.

INCREASE PRODUCTION
as many as
10 TIMES
with these new standard carbide tipped
MILLING CUTTERS

IT'S EASY to increase production as many as 10 times with Wendt-Sonis Standard Milling Cutters. These new milling cutters employ a negative radial and helix angle feature on the cutting edge for milling steel; positive angle for milling non-ferrous materials.

Distinctive Advantages of W-S Milling Cutters

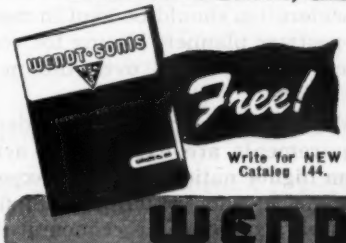
INCREASED SURFACE FEED—Machines hard alloy steel up to 750 surface feet per minute; non-ferrous materials up to 3400 surface feet per minute.

PREVENTS VIBRATION—The built-in heavy lug fly-wheel prevents vibration, adds strength to cutters; lengthens life of tool between sharpenings.

ESPECIALLY DESIGNED—for carbide cutting—not just a HSS design with carbide tips. Recommended for milling all types of material.

EASILY RESHARPENED—on any universal tool and cutter grinder.

Carbide Tipped Tools are a specialty with us. We make them exclusively. Our experience, research, development and improvements are your assurance of complete satisfaction when you use W-S Carbide Tipped Tools. Refer to "TOOLS" in your Classified Telephone Directory, for your local W-S Distributor, or write WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: LONG BEACH, CALIFORNIA.



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Welding—35-page booklet DH-821 gives recommendations for types of welding rods for different kinds of work. Each type of rod is fully described as to its application, position, current polarity, color marking, chemical composition, physical properties, finish, sizes, length, packing and current range. In all, 28 types are included for electric and gas welding. Page Steel & Wire Div., American Chain & Cable Co., Inc., Monessen, Pa.

Welding—Bulletin 120-A describes the use of forging pressure in projection welding problems in which a number of welds can be made at once, the electrode life is lengthened and irregular shaped pieces can be welded. Sciaky Bros., 4915 W. 67th St., Chicago 38, Ill.

NEW BOOKS

POSTWAR FISCAL REQUIREMENTS—*By Lewis H. Kimmel, Adah H. Lee, and Mildred Maroney. Published by The Brookings Institution, Washington 6, D. C. 166 pages. $2.*

Since postwar public expenditures, federal, state, and local, will have a great influence upon future tax policies, the authors have analyzed probable government costs for the 1949 fiscal year, expected to be a normal postwar year. They point out that information on future fiscal data is necessary to: (1) gage the total revenue requirements and the prospective burden of taxation; and (2) appraise the financial consequences of newly proposed legislation.

Peacetime government requirements are outlined in detail with explanations of probable trends reflected in the figures. The results indicate that postwar financial needs may come to $33,500,000,000, almost doubling the prewar cost of government (the total for the 1940 fiscal year was $17,400,000,000). This sober consideration should be kept in mind by postwar planners hoping for considerable tax relief over the next few years.

Major increases in postwar federal requirements are expected to arise from higher national defense expenditures, heavier veterans' benefits, greater promotion of economic development, and the heavy interest on our enormous debt. Probable 1949 interest on the federal debt shapes up around five billions, as against only $882,000,000 in 1940.

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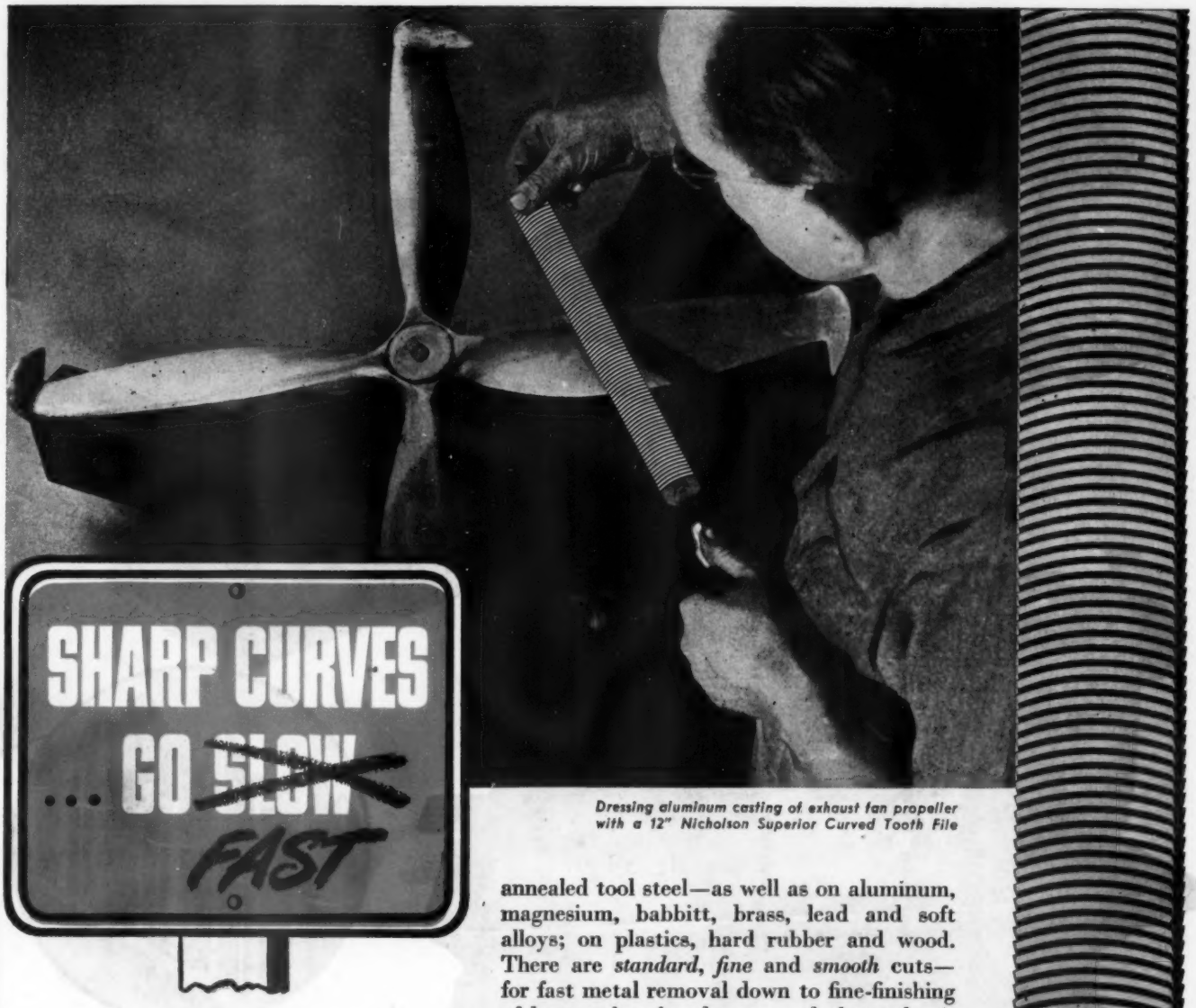

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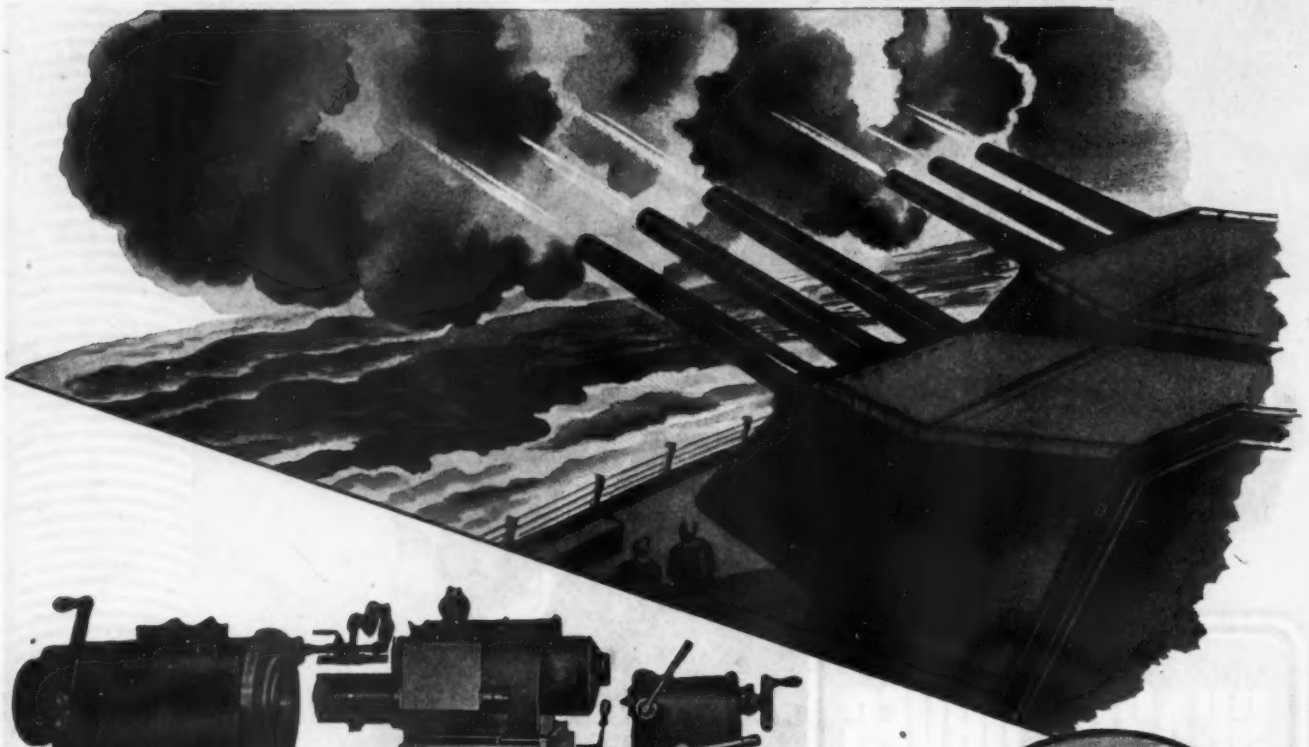

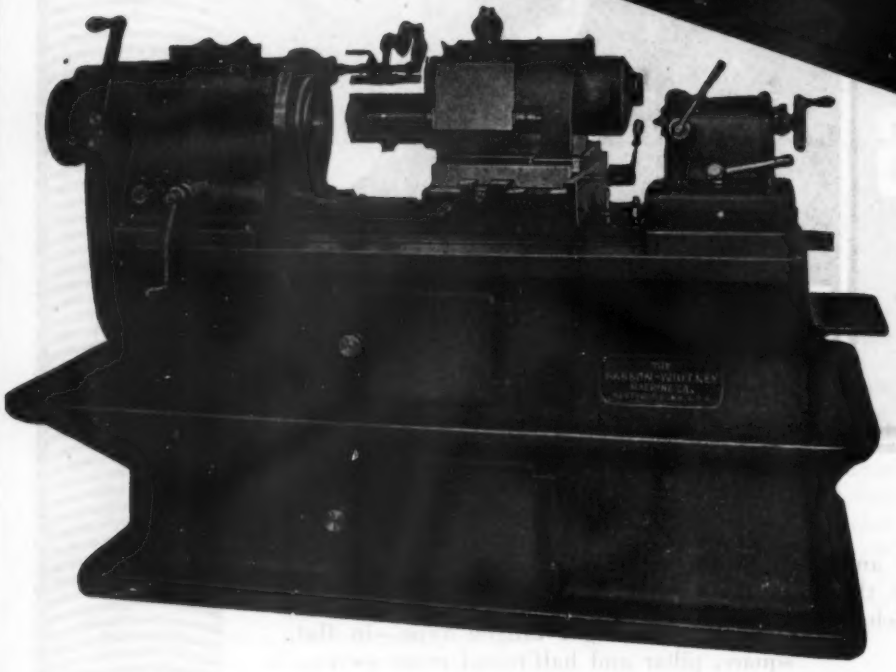

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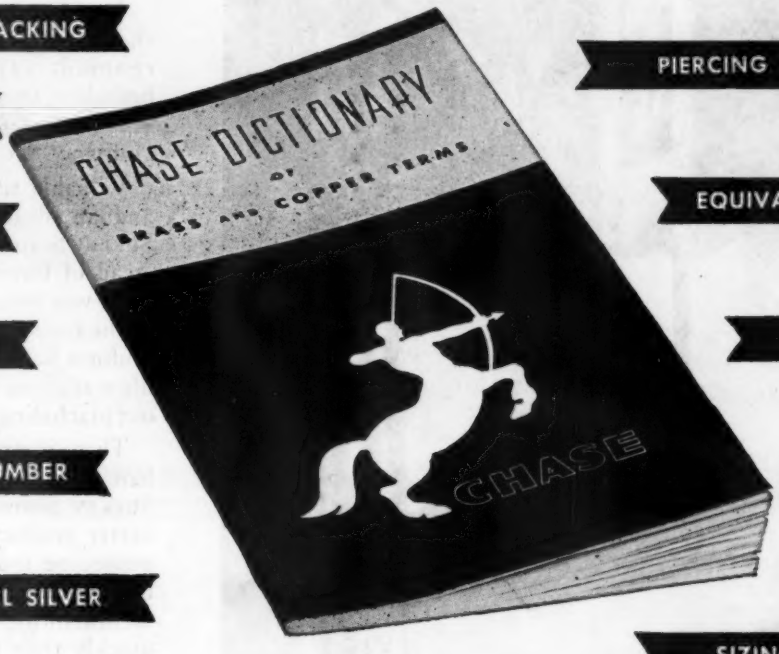

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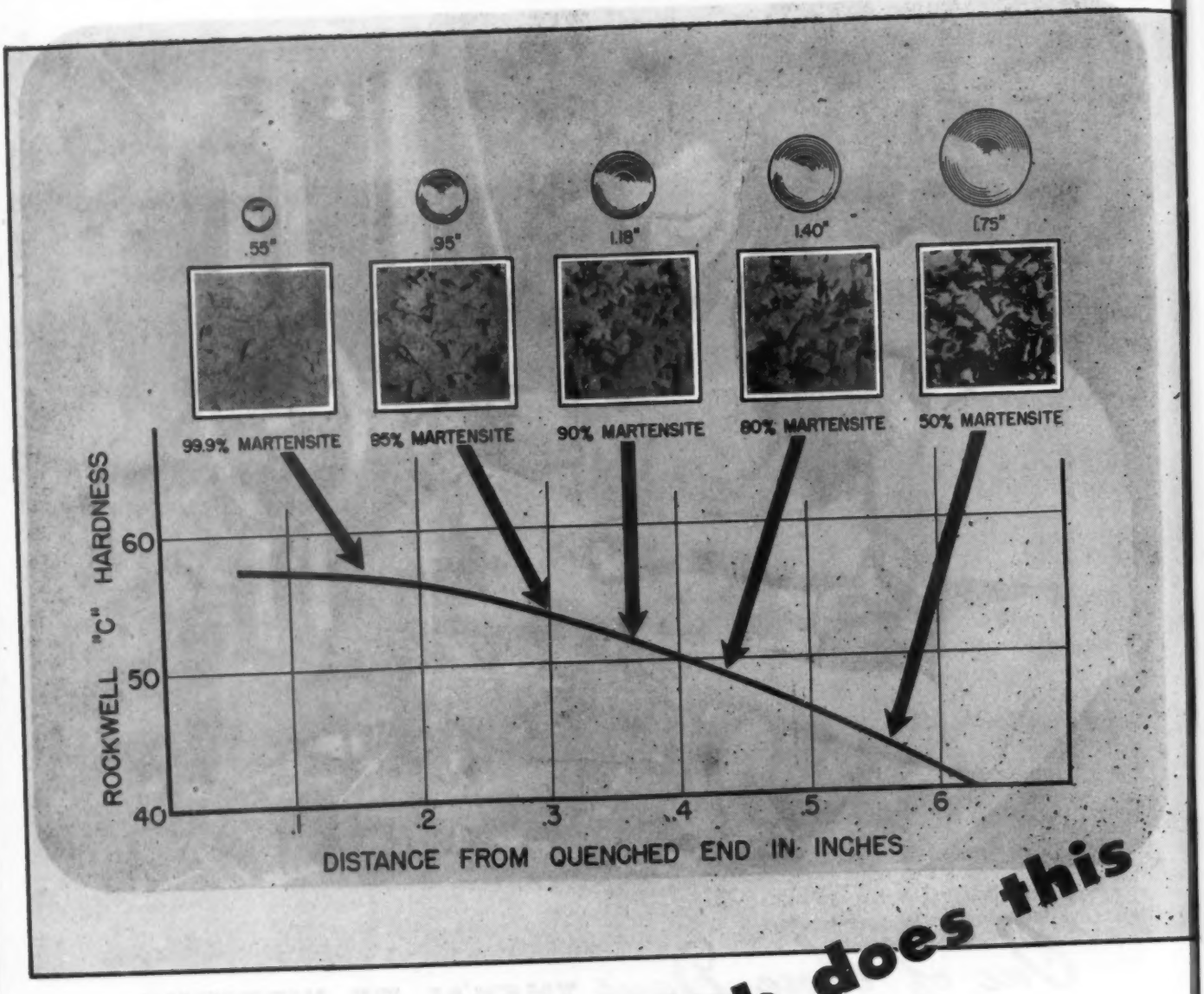

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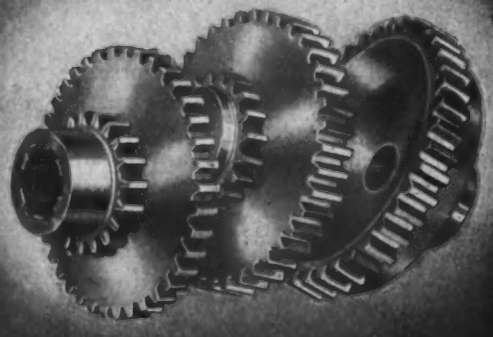

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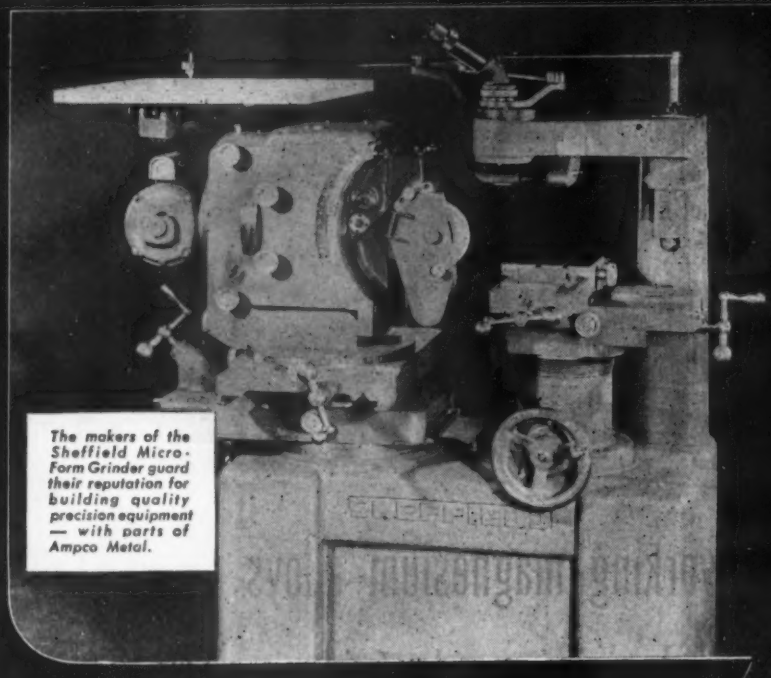

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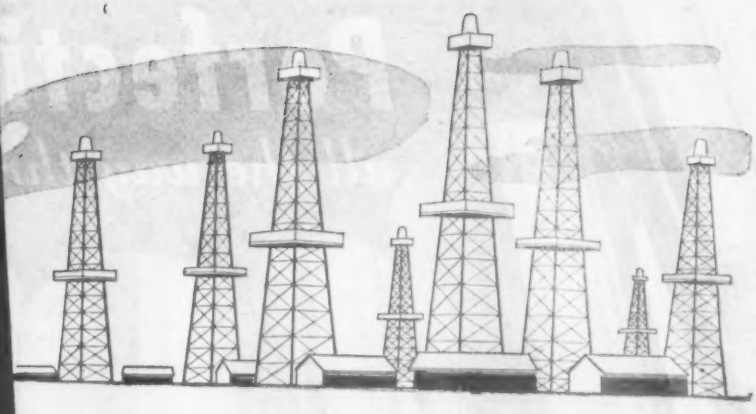

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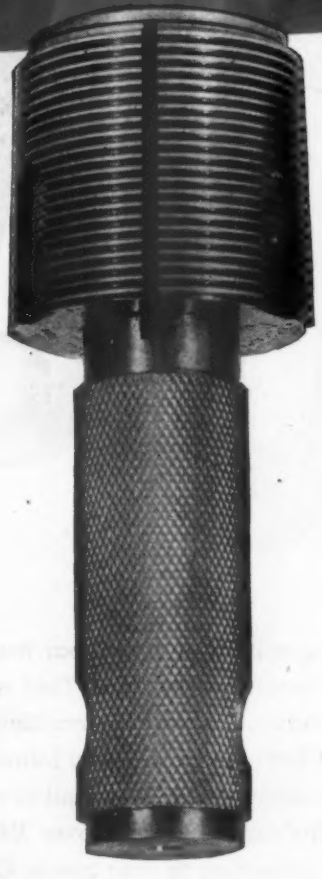

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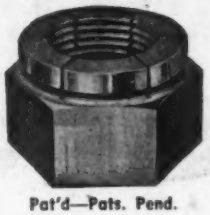

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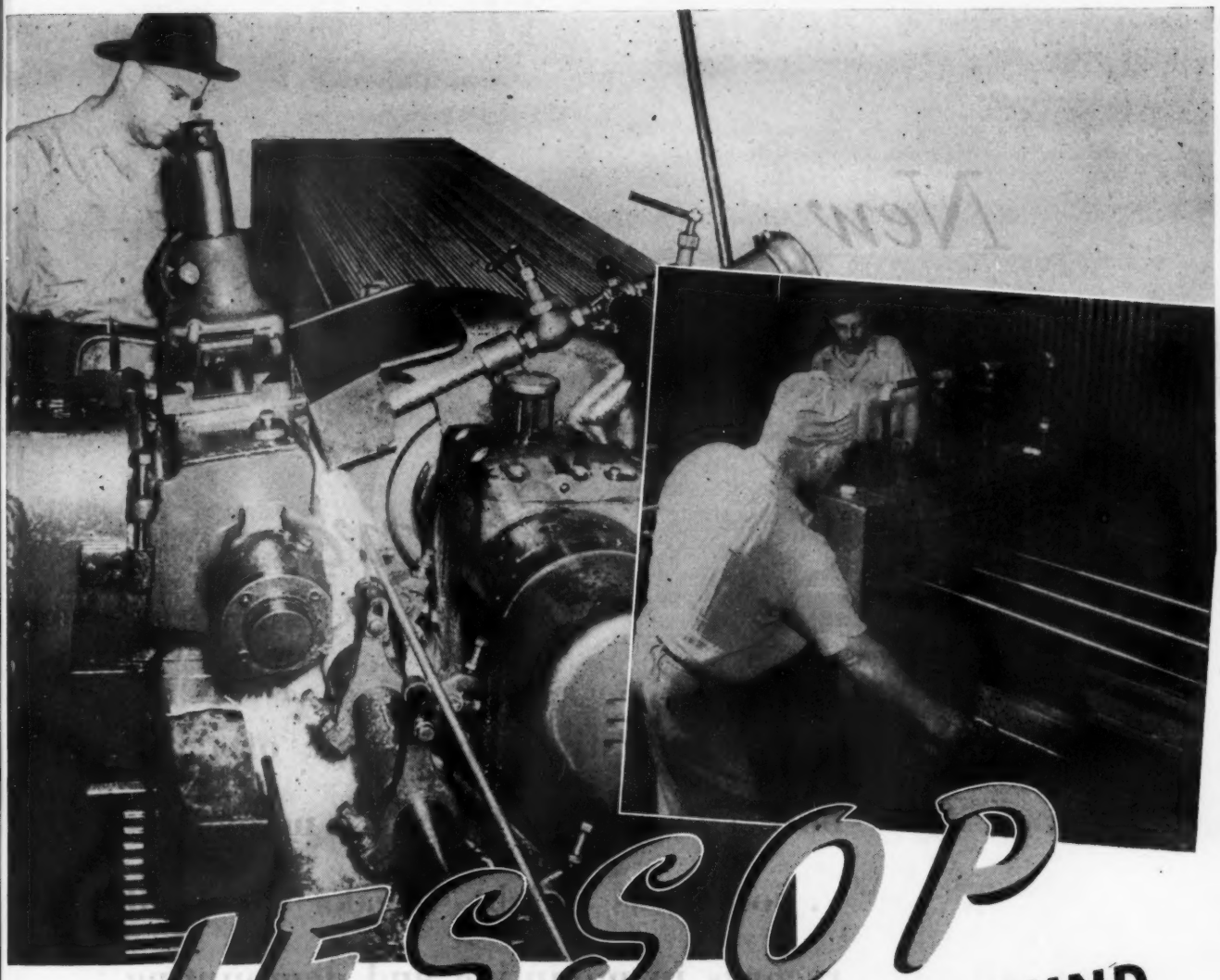

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New

TAPER-LOCK

Sheave

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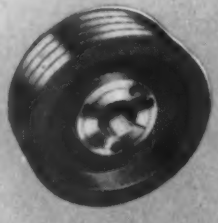

An entirely new type of taper bore sheave! No flanges . . no collars . . no excess weight. Breaks all speed records in mounting and demounting . . Saves time and temper . . And it's available in *ALL* stock sizes!

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- Here is the simplest, surest mechanism ever devised for holding wheels to shafts! No flange. No collar. No protruding parts.
- The Taperlock Sheave mounts as a complete unit. Slip it on, line it up and tighten *while sighting*. It's in place on the first try!
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- The Taperlock "unlocks" with less effort than any other sheave—due to its special taper.
- Taperlock Sheaves will be available in all stock sizes. For details call your local Dodge Transmissioneer. You'll find his name listed under "Power Transmission Equipment" in your classified phone book . . Or write Dodge, Mishawaka. .

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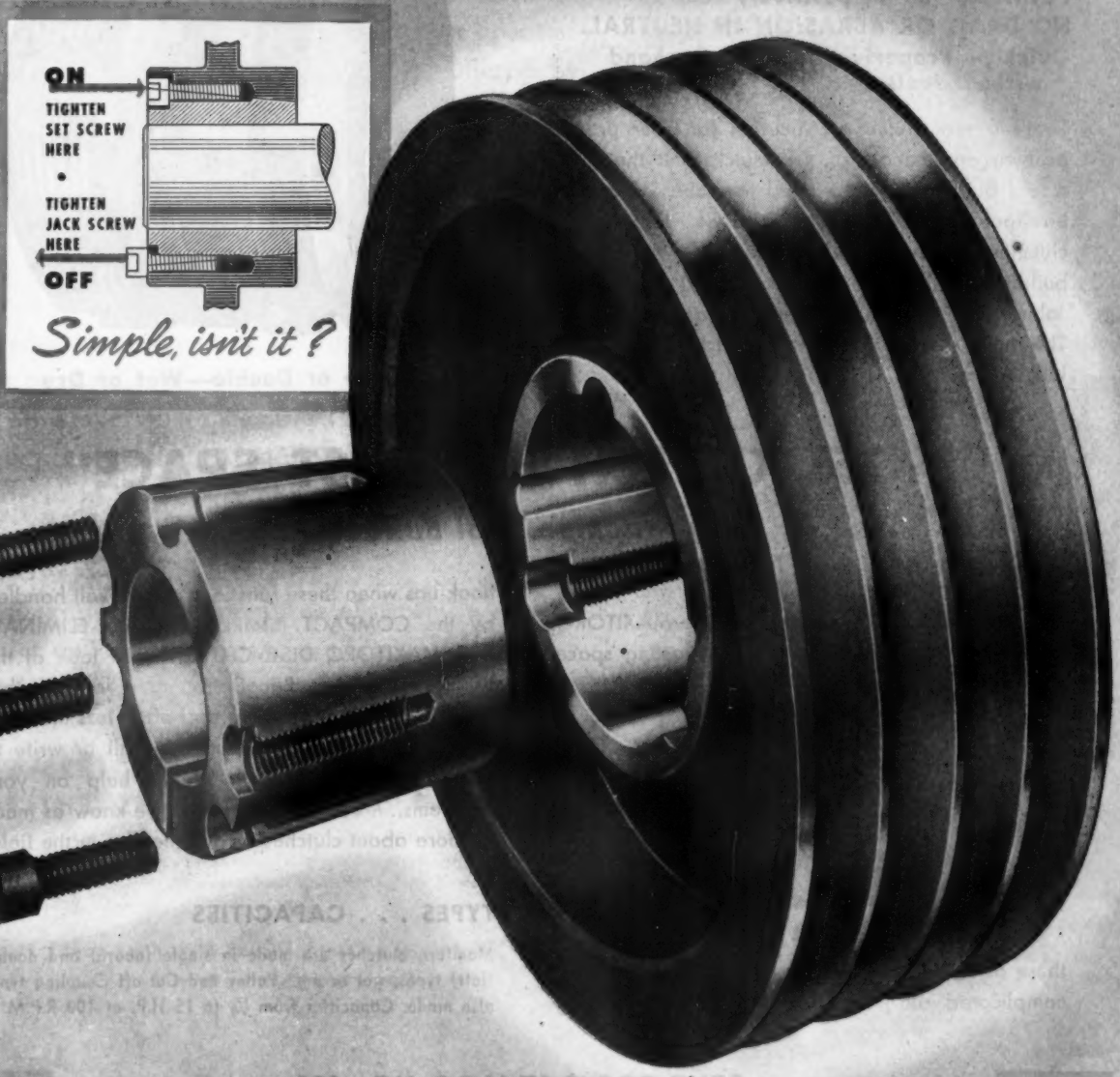

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DOUBLE TYPE CLUTCH

these days. No machine user need tolerate bulky, complicated old-time clutch, brake or reversing hook-ups when these functions are so well handled by the COMPACT, SIMPLE, TROUBLE-ELIMINATING MAXITORQ DISC CLUTCH. Just look at the list of real "User Benefits" . . . realize that MAXITORQS cost no more and often less than less satisfactory units. Then put in a call or write to our engineering department for help on your problems. Modestly we say . . . we know as much or more about clutches as anyone else in the field.

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Maxitorq clutches are made in single (above) and double (left) types, wet or dry. Pulley and Cut-off Coupling types also made. Capacities from ¼ to 15 H.P. at 100 R.P.M.

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Then look into the possibilities offered by American Flexible Metal Hose and Tubing.

Sturdy, leakproof connections of this material have improved literally thousands of types of products and equipment... from heavy machinery to small accessories. Illustrated are three examples... on each, flexible metal tubing is used to excellent advantage, yet for an entirely different purpose.

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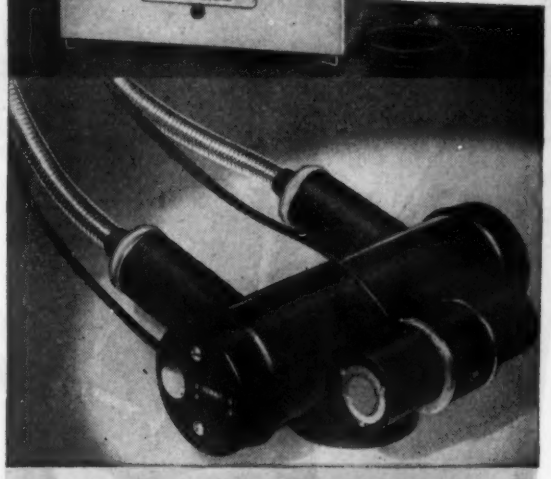
Flexible metal assemblies are usually easy to order and install. If *your* needs are unusual, our Technical Department can probably help.



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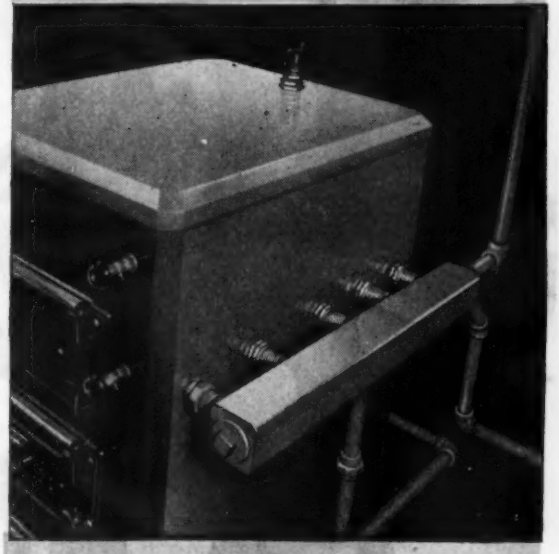
Interlocked Stainless Flexible Metal Hose used to reinforce end of electric cable and prevent wiring failure.



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V-J DAY—THAT'S THE RUSH—GET MORE PLANERS—GET TWENTY, THIRTY OF THEM ...BUT GET 'EM!
V-E DAY WAS JUST ANOTHER DAY TO THE OLD BULL.
HE WON'T TAKE A HOLIDAY UNTIL OUR AMERICAN FLAG IS FLYING OVER TOKYO!
"JUST ONE LITTLE WORD"
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The Old Bull Takes No Holiday

V-E Day didn't curl a hair on the Old Bull's head. He's still in there pitching for all he's worth to bring V-J Day along way ahead of schedule. So he and thousands like him are still pouring out their fast, mass-produced, high precision equipment to hasten the day of final victory.

We, too, are still at it—going full-speed ahead on war work. If you have a wartime or a postwar problem—we will be glad to help.

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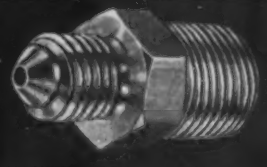

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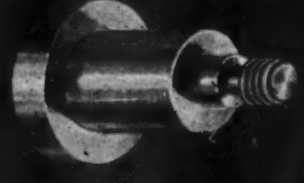

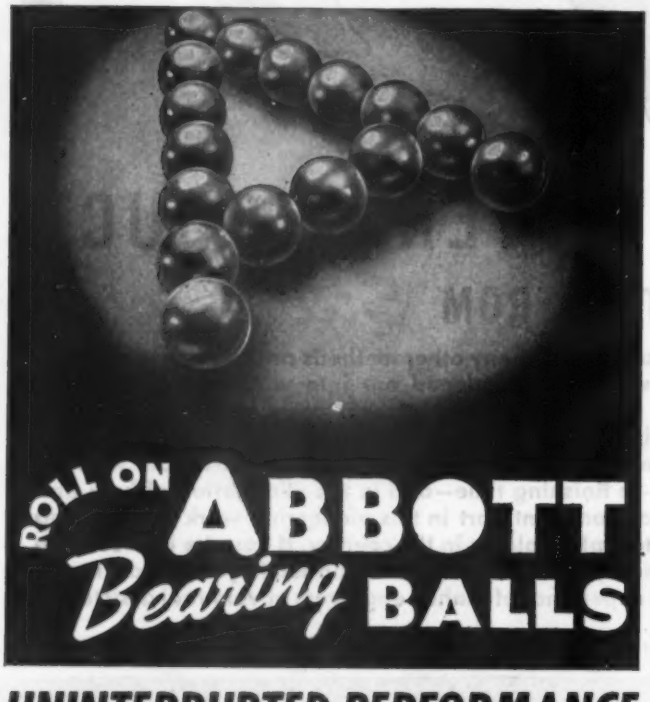

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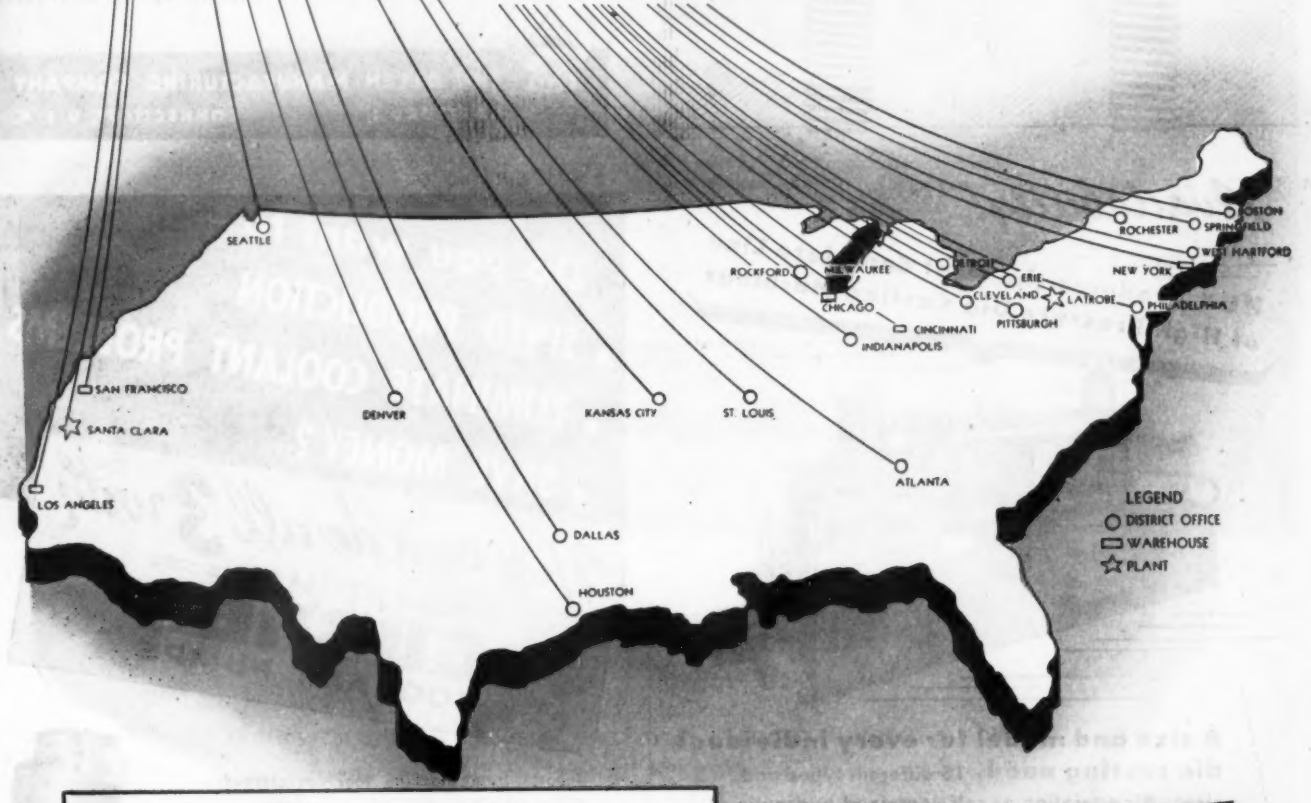
Kennametal soon became established as the tool material that made possible machining of hard steel, accurately, at economy-promoting speeds. In eight years its use has spread, until today Kennametal Inc. has grown to such stature that it successfully serves hundreds of America's major metal-working plants.

Kennametal Field Engineers are more at home in these plants than in their own offices. Their on-the-spot "know-how" enables Kennametal users to obtain optimum production from a tool material that has demonstrated amazing inherent effectiveness. Call on them—they are at your service to help you get maximum output with minimum consumption of carbide.



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Kennametal—constantly improved throughout the years—now costs its users less than one-tenth of what it did when introduced. This price reduction has been achieved wholly because of increased production and improved manufacturing technique—the very conditions that you can help to bring about in your metal-working plant, through proper utilization of Kennametal tools.

ALLEN FLAT HEAD CAP SCREWS

set up *flush* in holding thin plates or superposed parts, without weakening the metal with deep countersink.

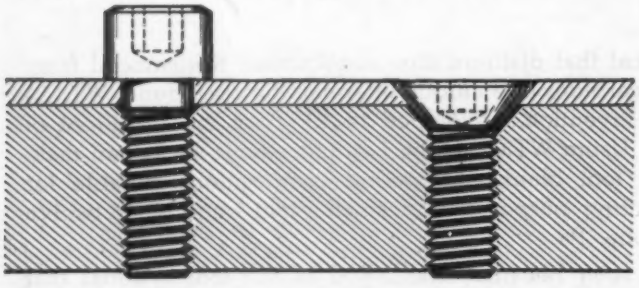
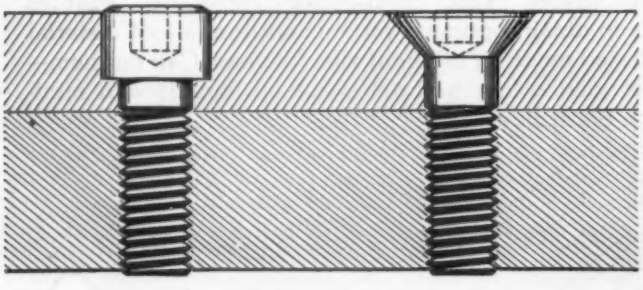


Figure 1, above, (right) shows flush surface achieved in tieing down metal piece thinner than head height of screw.

Figure 2, below, shows advantage in fastening relatively thin plate to retain flush surface without weakening the metal with deep countersink. Note more binding surface under head.



Here's the way to apply ALLEN holding-power to comparatively thin plates where a flush top surface must be achieved, with no gap between screw head and surrounding metal.

Note that top piece of metal in Figure 1 is thinner than head height of the Flat Head Cap Screw. There's more binding surface under the head than is the case with a projecting-head screw, and the angle helps lock the screw in place by drawing down on a conical surface.

Figure 2 shows application in a comparatively thicker plate. Here the flush surface is retained without weakening the metal with a deep countersink. Maximum strength in the screw itself is assured by "pressur-forming" of special-analysis ALLENOY steel.

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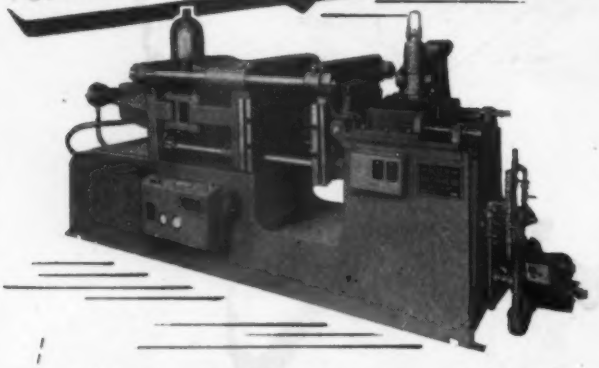

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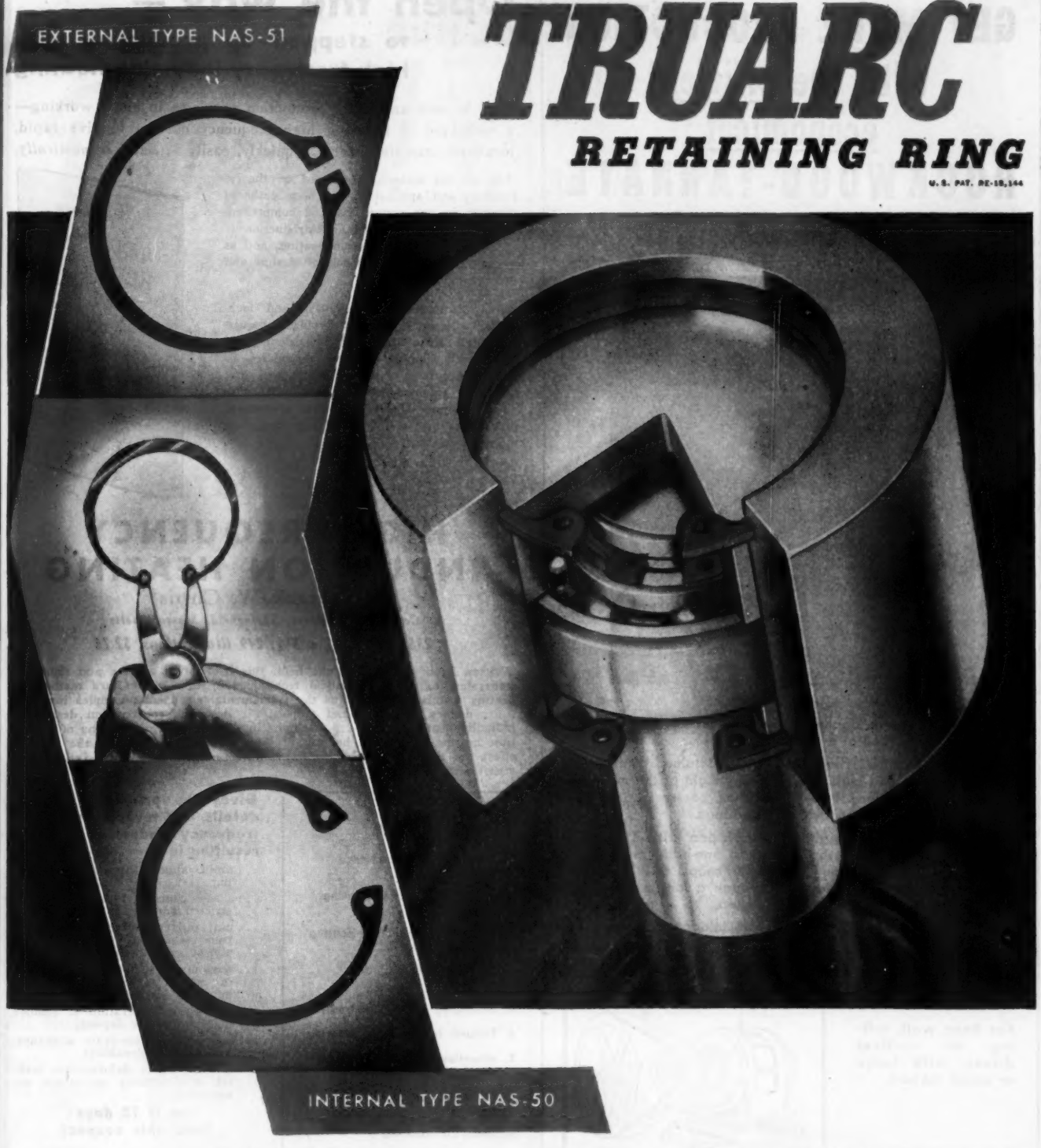

Waldes Truarc expands or contracts without distortion and without permanent set, fitting tight all around the groove. It offers important advantages over shoulders, nuts, collars, etc., for all thrust-load fixings in shaft and housing applications. It saves space, weight, assembly time and machining costs. Waldes Truarc presents a significant advance in retaining rings, well worth your thorough investigation. We will gladly furnish samples and full data for tests, upon request.

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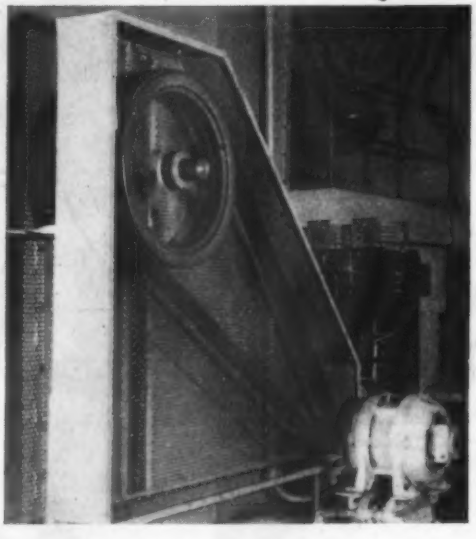

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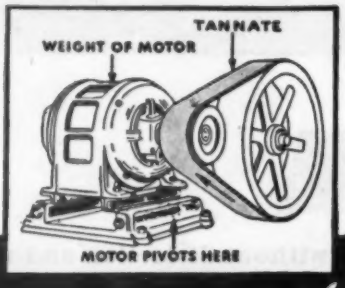

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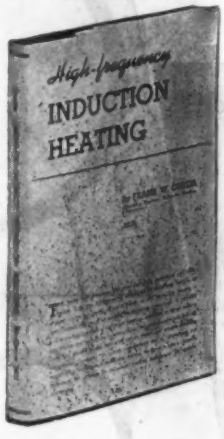

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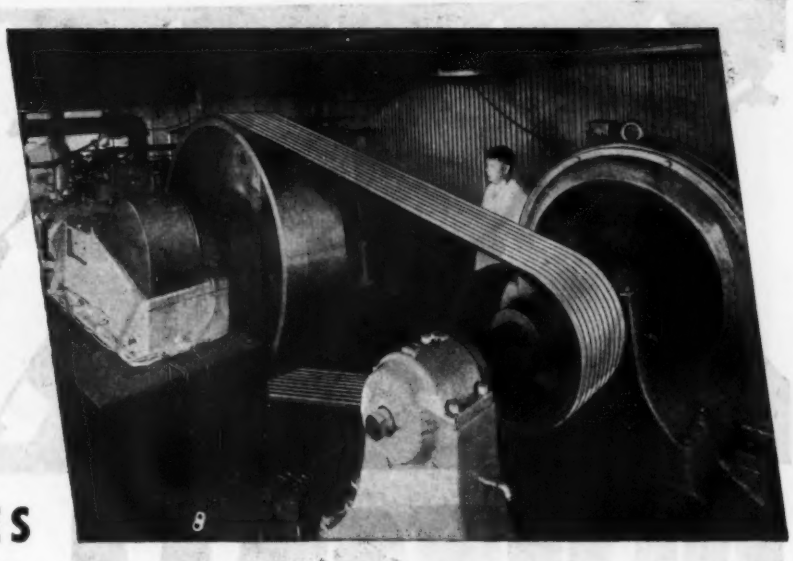

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are the BEST V-BELTS Gates Ever Delivered to You!

That is a strong statement but it is simply a *fact*—and here are the reasons for it.

To meet the needs of our Army's tanks, tractors and self-propelled big guns in *combat service*, it was necessary to develop V-Belts far superior to any that had ever been built before. Gates developed and built these greatly superior V-BELTS—and here is why this fact is important to you:--

- Every improvement developed by Gates for these Army V-BELTS has been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.

You have not had to wait until after the war for these improvements for the simple reason that more efficient V-Belts have been an important factor in increasing essential war production. That is why your standard Gates Vulco Ropes are today the best V-Belts that have ever been delivered to you.

In addition, where V-Belts of special construction are required, your Gates Rubber Engineer is in position to supply a Gates V-Belt that is precisely engineered to meet your special needs. You need only pick up your phone book and look under the heading "Gates Rubber." The Gates Rubber Engineer will bring to you, right in your own plant, the very latest advances in V-Belt construction and in drive operation as well.

IN ADDITION--

Gates also makes these special belts to meet exceptional service needs.

- Rayon Cord V-Belts
- Static-Safety V-Belts
- *Special* Synthetic V-Belts
- Cotton Cord V-Belts
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All Gates V-Belts are Built With *The Patented* **CONCAVE SIDE**

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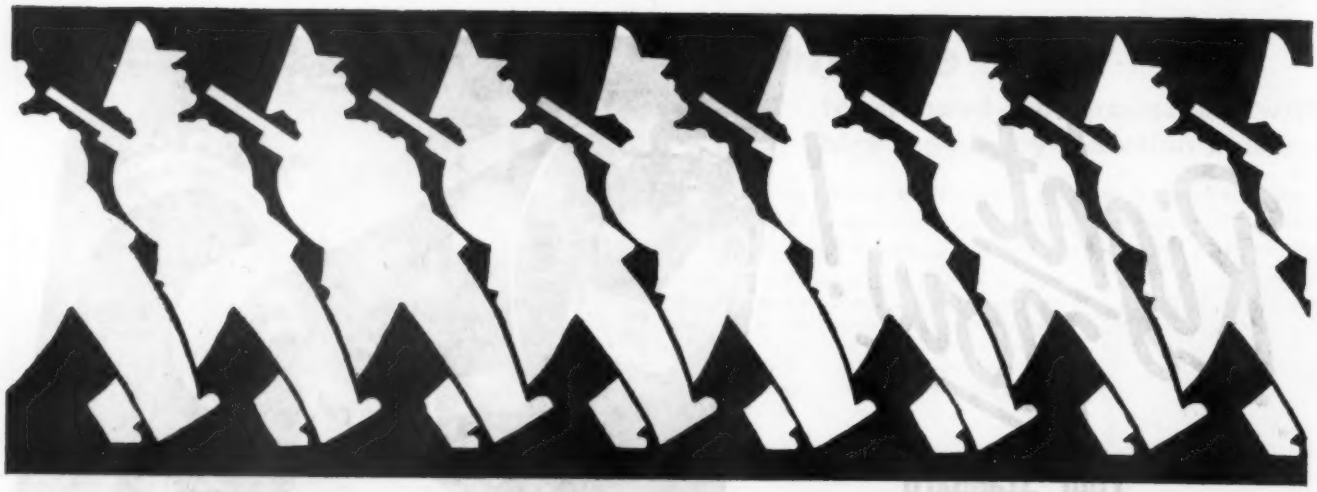

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SOCKET SCREW PRODUCTS

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"UNBRAKO"
SOCKET HEAD
CAP SCREW

Knurling of Socket Screws originated with "Unbrako" years ago.

These can be used with absolute confidence in their uniformity of strength, accuracy and hardness. Uniformity is present from start to finish in the making of "UNBRAKO" screws, produced in one of America's most modern automatic machine shops.

The Knurled "UNBRAKO" Socket Cap Screw shown at left is popular with mechanics. Even oily fingers get a non-skid grip on it—screw it in faster and farther before a wrench is needed.

The Knurled Point "UNBRAKO" (bottom right) is an absolutely dependable Self-Locker. No amount of vibration will rattle it loose—the knurls dig in and hold tight.

Sizes in these two screws: No. 4 to 1½" diameter—full range of lengths.

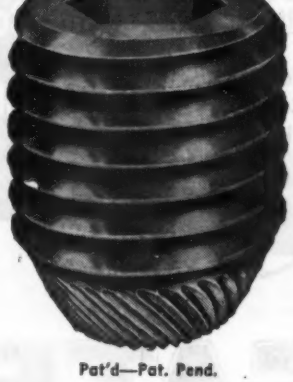
Where the Knurled Cup Point "UNBRAKO" cannot be used, use our Knurled Thread "UNBRAKO"—also a Self-Locker, regardless of the style of point. (Bottom left.)

Write for the Catalog of "UNBRAKO" Socket Screw Products.

Patented

KNURLED THREAD
"UNBRAKO"
SET SCREW

KNURLED CUP POINT
"UNBRAKO"
SOCKET SET SCREW



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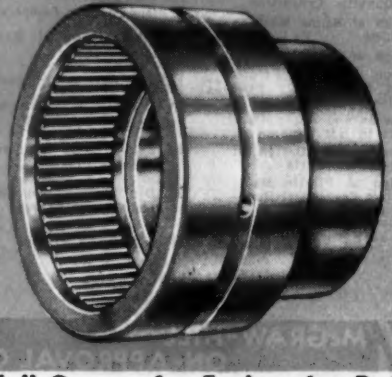
WITH ORANGE ROLLER BUSHINGS



It's no easy matter to make replacements and repairs on underground mining equipment. That's why Goodman Mfg. Co. emphasizes trouble-freedom in building its mining machinery and selecting parts for it. That Orange Roller Bushings meet these strict standards in the transmissions, planetaries and conveyor shafts is confirmed by Goodman's report—"trouble-free service over long periods of time."

The smooth, quiet, long life operation that characterizes Orange Roller Bushings under severe loads and gruelling conditions, is due to their closer internal running clearances which keep the rollers in alignment with the highly finished raceways. Maintaining dimensional uniformity of rollers to extremely close tolerances makes this construction possible. Write for the complete engineering data book showing designs, sizes, capacities, installation data, etc.

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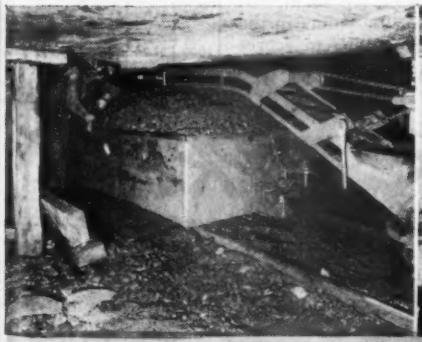

Orange Roller Bushings prevent wear on the drive and driven shafts on the slack conveyor of the Goodman Type 724 Track-Mounted Cutting Machine.

Twelve Orange Roller Bushings take heavy shock loads in the planetaries that control the wire rope drums of this Goodman Shortwall Machine.

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Orange Roller Bearing Co., Inc., AM
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Handbook on Designing for Quantity Production

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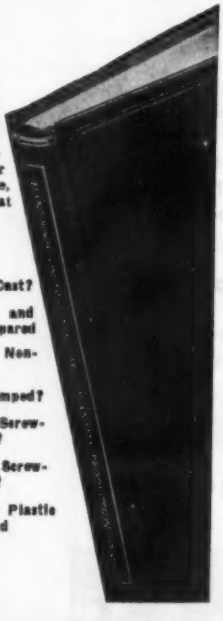

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3. Design of Screw Machine Products
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5. Design of Die Forged Parts for Quantity Production
6. Notes on and Accomplishments in Hot Heading
7. Notes on the Design of Cold-headed Parts
8. Design of Plastic Moldings for Economical Quantity Production
9. Die Cast or Sand Cast?
10. Permanent-mold and Die Castings Compared
11. Which Type of Nonferrous Casting?
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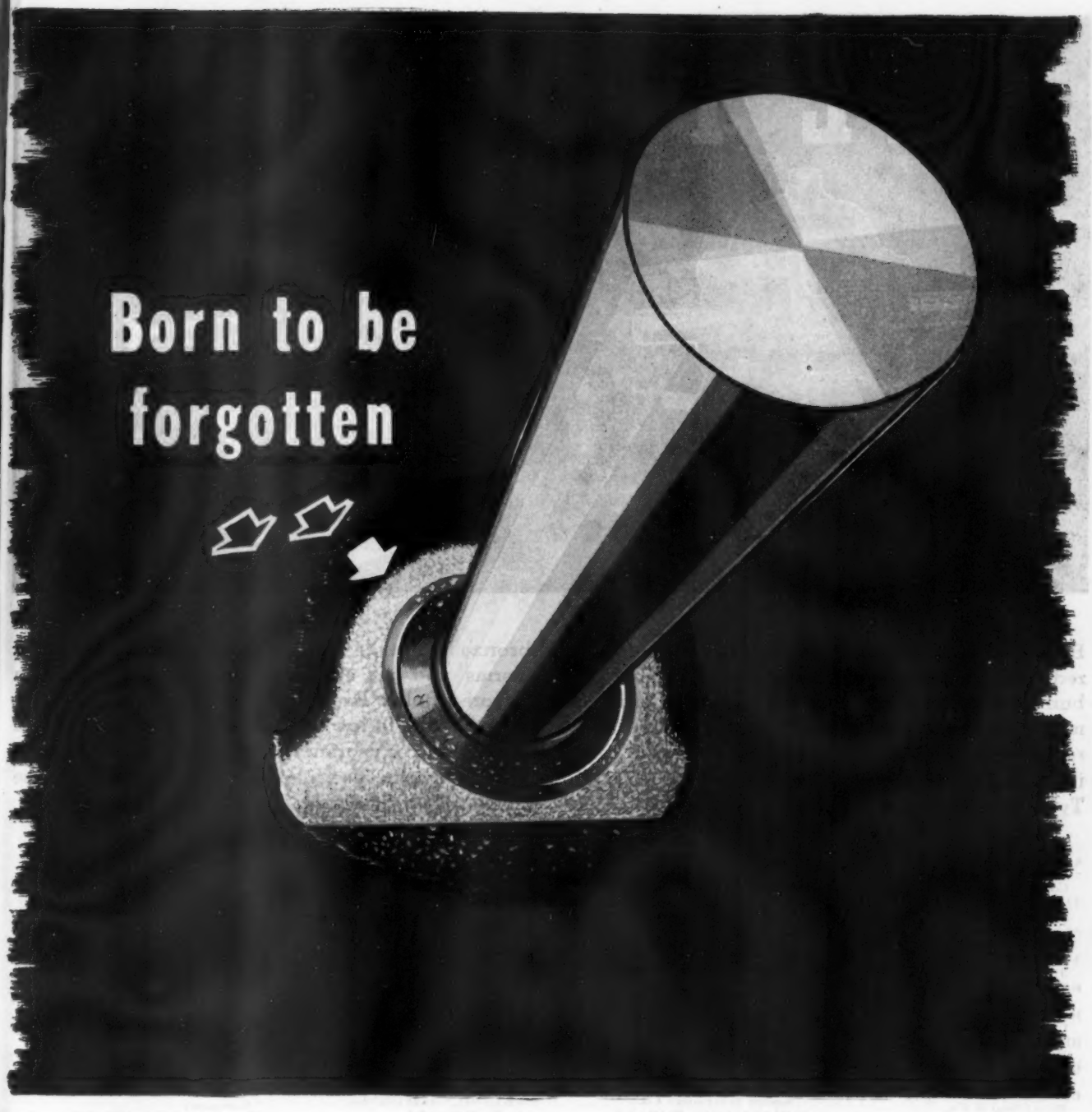

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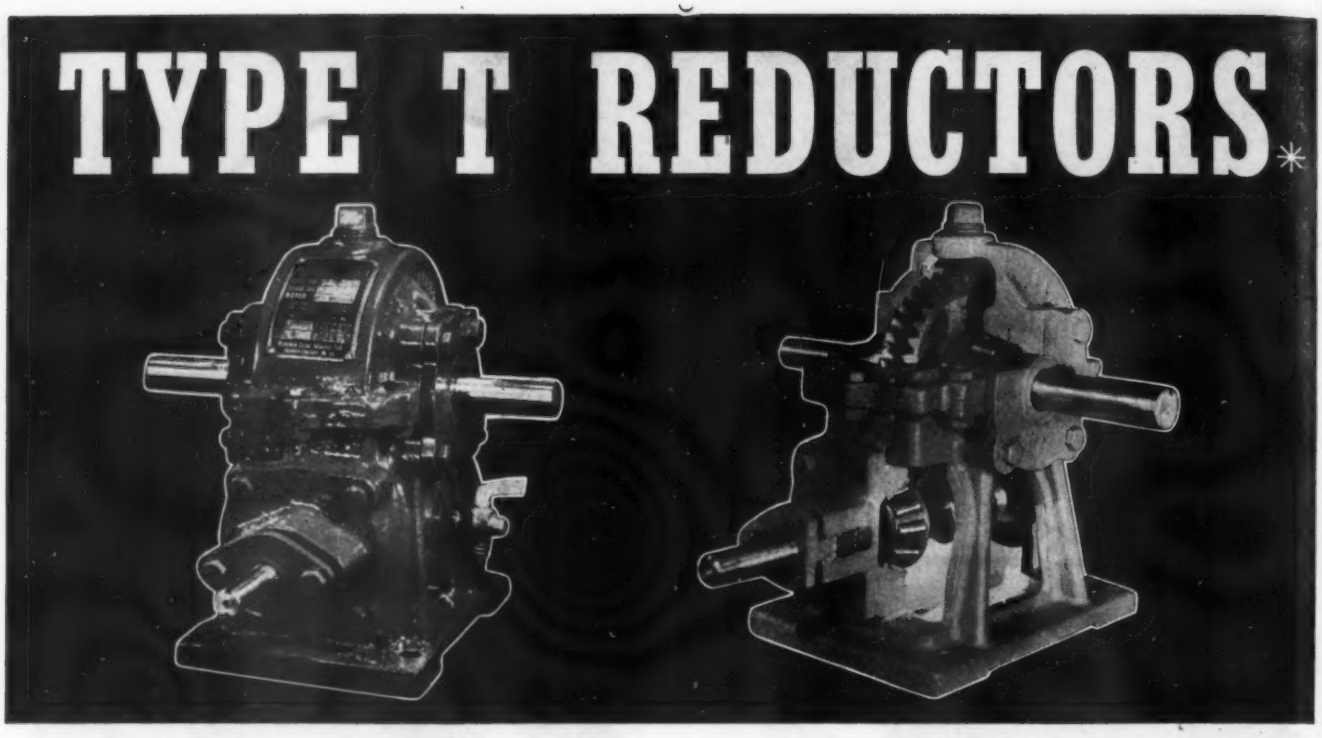

Boston Gear Standard Type "T" Reductors (speed reducers) are just one of fifteen types designed and built to provide you with economical and efficient means of speed reduction. They are available in ratios of 9¾ to 1 to 100 to 1 and are rated to carry input loads varying from ¼ to 9 horsepower. All Type "T" Reductors are equipped with phosphor bronze worm gears, hardened and ground steel worms and all shafts are mounted on Timken Tapered Roller Bearings.

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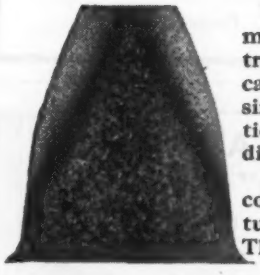

Yes, two to three times the power will be transmitted by a surface hardened gear over an untreated gear of the same size. With small gears case hardening will satisfactorily produce the desired surface hardness. However, this is not practical for large gears because of the relatively high distortions, so Flame Hardening was developed.

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Our Catalog No. 42 gives further details on flame hardening, and also describes our complete facilities for manufacture of industrial gears of all types. Write for a copy on your business letterhead.

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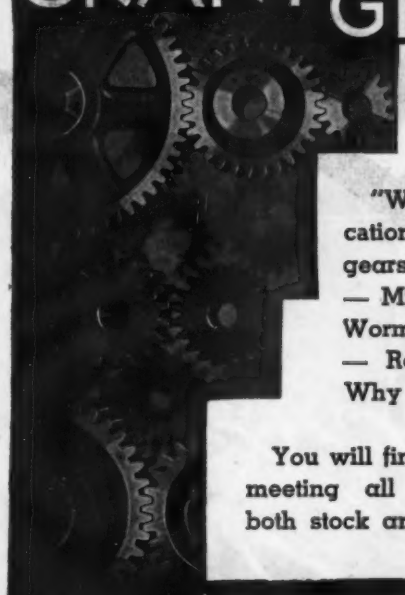

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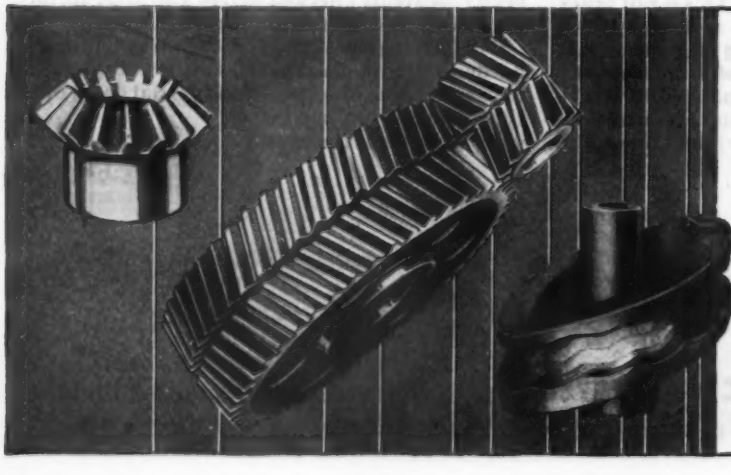

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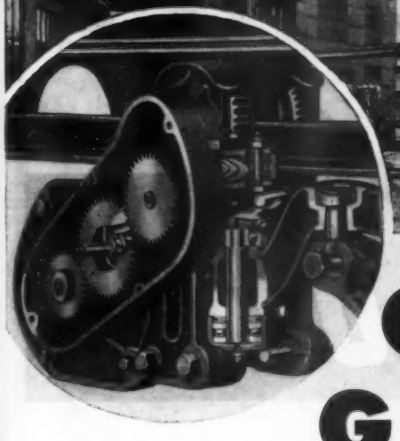

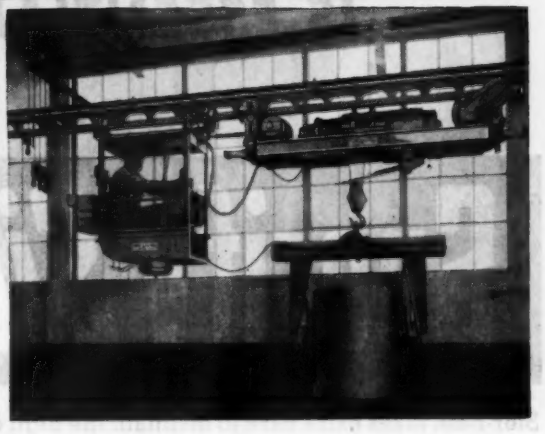

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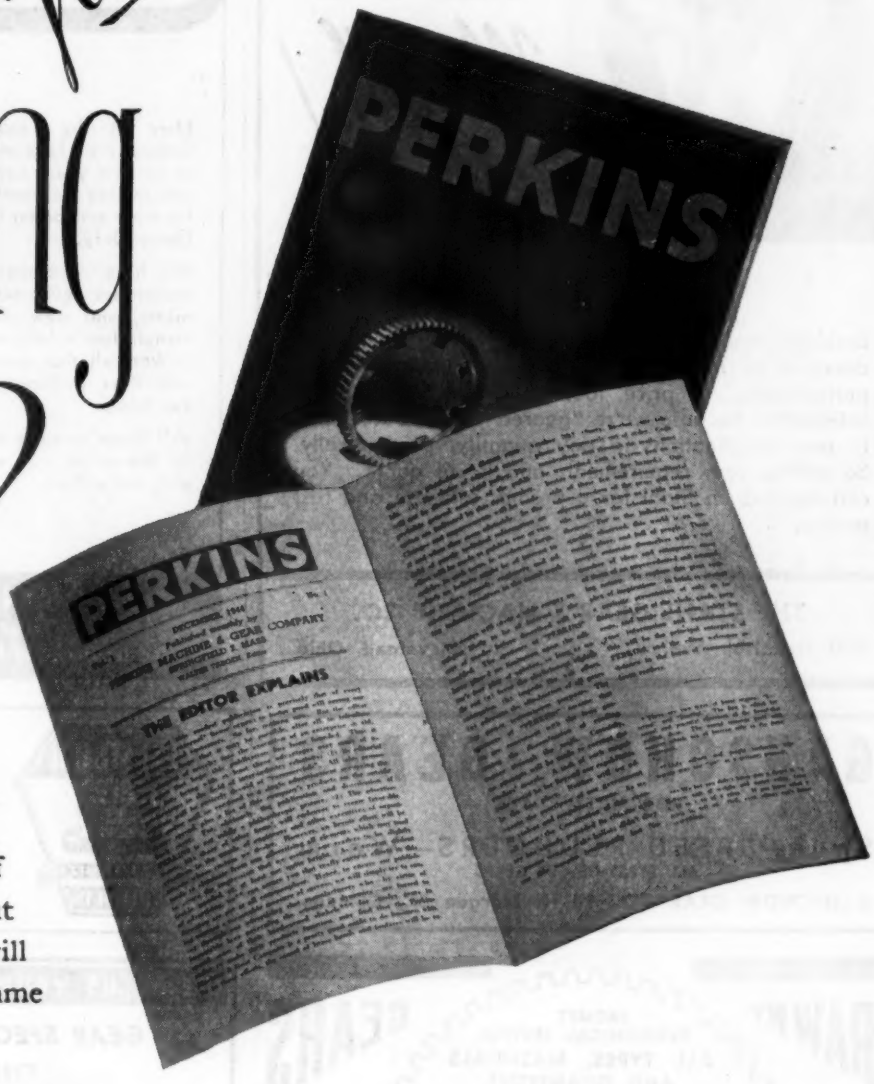


PERKINS is the name of the house organ we publish monthly. If you are a Purchasing Agent or Engineer of a firm which uses custom-cut gears in its products, we will be pleased to place your name on our mailing list.

The editorial content covers a wide range of interests and may be either amusing or instructive; at any rate, it is devoid of "commercials." Sales promotion matter is confined to a list of the company's products on the outside back cover, plus a single advertisement occupying the center spread. The purpose of these advertisements is to convey the idea that we not only know our business thoroughly, but that in general, we are a pretty good outfit to do business with. Please write us on your firm's letterhead if you wish to receive Perkins. Price of subscription: Your Good Will.

PERKINS MAKES: Helical Gears, Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Spur Gears, Ground Thread Worms

PERKINS *custom-cut* **GEARS**

PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD 2, MASS.

GEARS THAT WILL *Measure Up!*

Stahl gears will measure up to every requirement you demand—in material, accuracy, workmanship and performance. In price, too, you'll find Stahl assures satisfaction because we're "geared" to produce gears to any specifications in any quantity, economically. So outline your requirements and let us quote. You can depend on Stahl for a prompt estimate and fast service.

THE STAHL GEAR & MACHINE CO.
3901 Hamilton Ave. Cleveland, Ohio

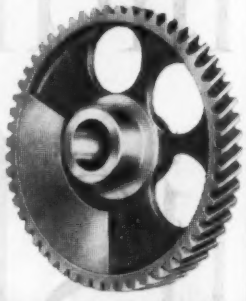
YOU CAN PROFIT FROM THIS GEAR *Experience*

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL

Here at the Cincinnati Gear Company we have made the most of our war years' experience . . . anticipating the needs of industry for more and better Gears, Good Gears Only.

We have developed many new techniques, refinements, improvements, and new ideas in gear manufacture to help industry benefit from all that greater precision and finer performance in gears can bring.

All these services can be yours for the asking . . . we are ready, able and willing.



THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

GANSCHOW GEARS
FOR SIXTY YEARS
Spur—SPEED REDUCERS—Worm
ALL TYPES OF CUT GEARS
GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

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STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST
46 Styles—195,000 Sizes
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Machined Steel Semi-Steel
Send for our new catalog
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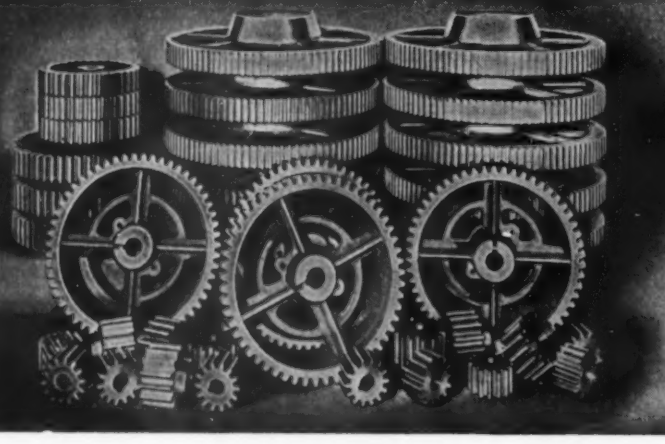
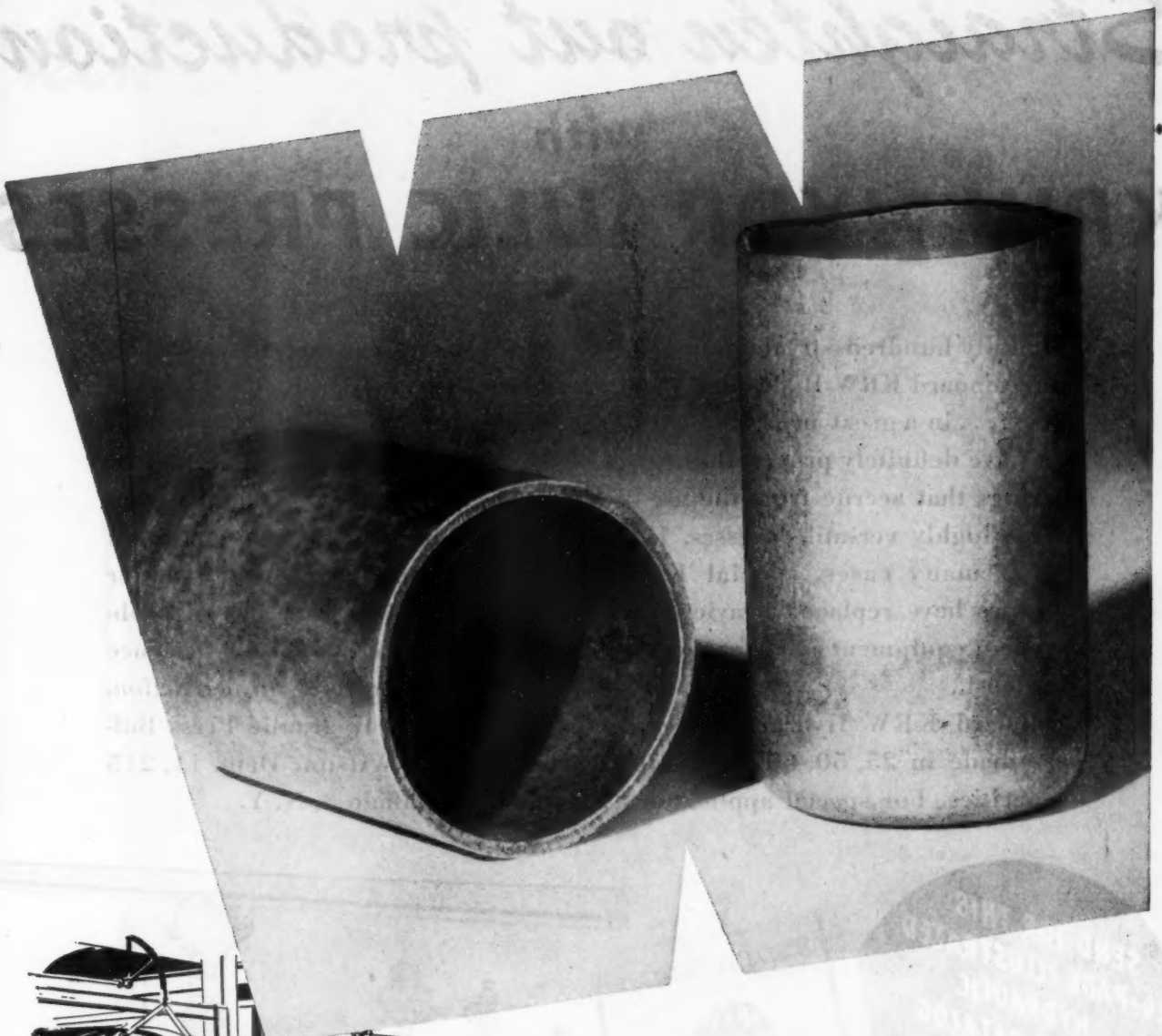
PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS
AND QUANTITIES
Ask for Estimate
BRAUN GEAR CO., 1590-1608 Atlantic Ave., Brooklyn, N. Y.

SEND US YOUR PRINTS FOR *Quotations*
GEAR SPECIALISTS — BROACHING
THREAD GRINDING
TAYLOR MACHINE CO.
1917 EAST 61ST ST. ★ CLEVELAND 3, Ohio



ADAMS GEARS
SPUR — HELICAL — WORM
BEVEL — MITER — RACKS
Splined Shafts A Specialty
THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa



Presteel Stamps High Temperature Alloys

The cups shown above are interesting because of the fact that they are stamped from an alloy of 28% chrome, 1% nickel, .35% carbon and the balance iron and impurities. The material is known as type 446; it resists oxidation, and will withstand temperatures up to 1900° without affecting its shape or strength.

An alloy of this type is not easily fabricated, but Presteel, after developing an efficient annealing cycle, was able to produce these X-ray parts at a considerable saving over the former machining method.

For further information on the processing of unusual materials, write for free copy of "Deep Drawing Magnesium Domes" to—

WORCESTER PRESSED STEEL CO.

208 Barber Avenue — Worcester 6, Mass.

ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

Representatives in New York, Chicago, Detroit, Philadelphia, Syracuse, Buffalo, Indianapolis, Canton, Ohio, Alexandria, W. Virginia, Fort Worth, Denver, Los Angeles, Toronto

Straighten out production

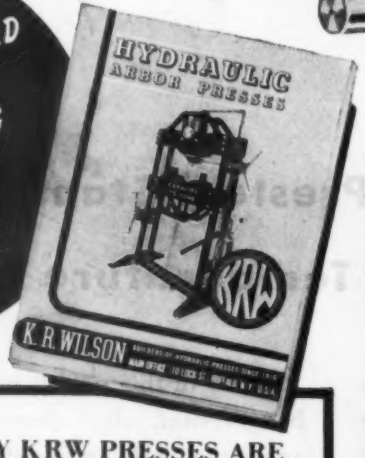
with

KRW HYDRAULIC PRESSES

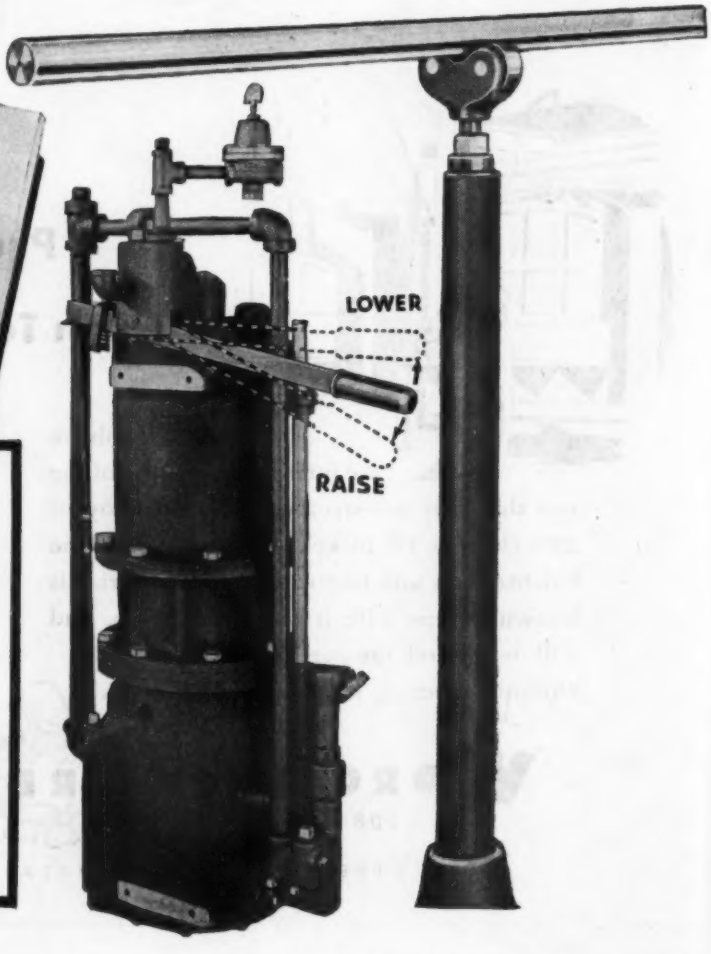
Literally hundreds of adaptations of the standard KRW Hydraulic Arbor Press . . . in a great many industries . . . have definitely proven the many savings that accrue from the use of these highly versatile presses. In a great many cases, special KRW Presses have replaced heavier, outmoded equipment at a fraction of the cost.

Standard KRW Hydraulic Presses are made in 25, 50, 60 and 75-ton capacities. For special applications, these presses can be engineered to solve a specific problem . . . either hand operated, air-oil, electric-oil operation or in any combination. This equipment is so flexible that we have been able to design, build and ship special presses in a matter of weeks. Bring your special problems to us. We have the experience and facilities to give you *fast action.* Write for our Hydraulic Press Bulletin. K. R. Wilson, Dept. 11, 215 Main St., Buffalo 3, N. Y.

SEND FOR THIS 24-PAGE ILLUSTRATED HYDRAULIC PRESS CATALOG ... full of valuable data!



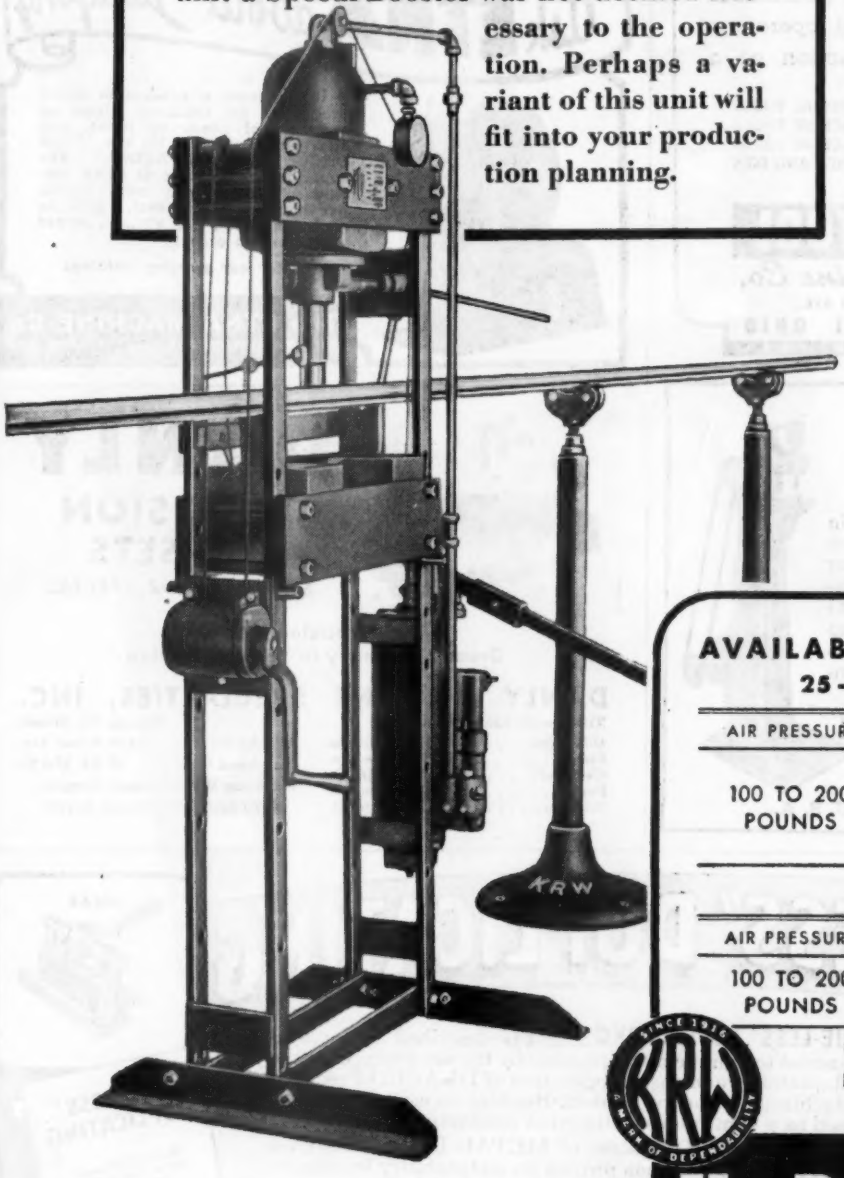
THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.

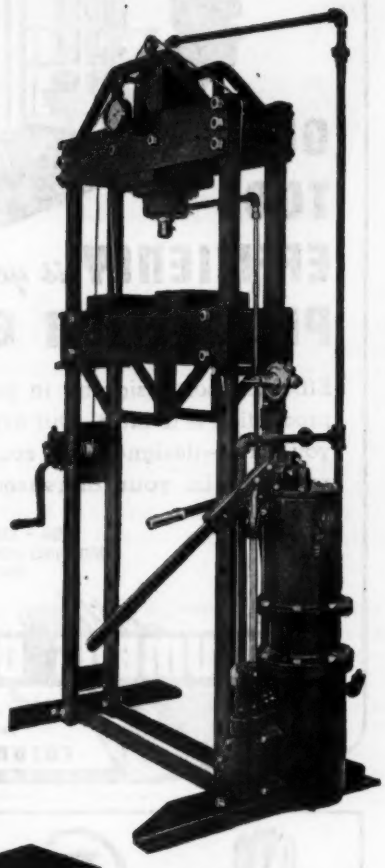


kinks... CUT COSTS

WAR-PROVEN ADVANTAGES OF LOW-COST KRW PRESSES ARE NOW BEING ADAPTED TO PEACETIME PRODUCTION SCHEDULES

This KRW Hydraulic Arbor Press was specially adapted for straightening propeller shafts of great length. On this particular unit a Speedi-Booster was not deemed necessary to the operation. Perhaps a variant of this unit will fit into your production planning.





75-ton KRW Press equipped with patented Speedi-Booster and Finger-tip control.

AVAILABLE TONNAGE PRESSURES

25-50-60 TON PRESSES

AIR PRESSURE	7" AIR CYLINDER		9" AIR CYLINDER	
	2" Oil Cylinder	1¾" Oil Cylinder	2" Oil Cylinder	1¾" Oil Cylinder
100 TO 200 POUNDS	10 to 22 Tons	14 to 29 Tons	17 to 35 Tons	23 to 47 Tons

75 TON PRESS

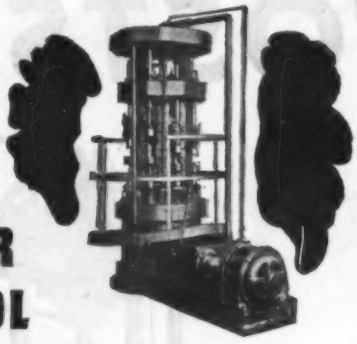
AIR PRESSURE	9" AIR CYLINDER	
	2" Oil Cylinder	1¾" Oil Cylinder
100 TO 200 POUNDS	25 to 51 Tons	33 to 68 Tons

Write Today for the KRW HYDRAULIC PRESS CATALOG

SINCE 1916 KRW A NAME OF DEPENDABILITY

K. R. WILSON

BUFFALO 3, NEW YORK



OUR TOOL EFFICIENCY *is your* **PRODUCTION EFFICIENCY**

Efficient tool designing in post war competitive production is a "must". Our experience guarantees you tools—designed for economy of operation, resulting in your increased production at a lower cost.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

COLUMBUS DIE·TOOL *and Machine Co.*
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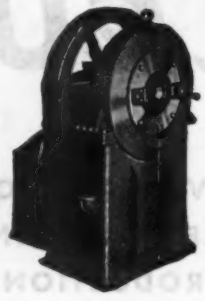
COLUMBUS 1 OHIO
ESTABLISHED 1908



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

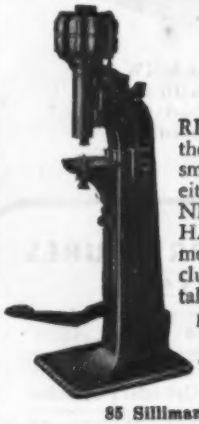
The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

"Ask ETNA about Swaging"

● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

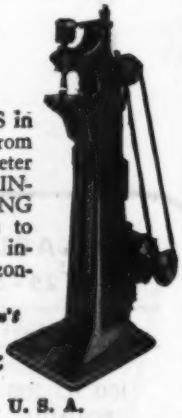
The ETNA MACHINE Co.
3400 MAPLEWOOD AVE. TOLEDO, OHIO



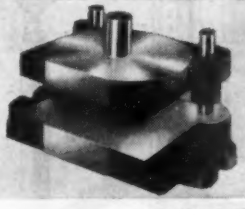
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.



DANLY
PRECISION DIE SETS
STANDARD OR SPECIAL

Their Precision Means Greater Accuracy in Your Production

DANLY MACHINE SPECIALTIES, INC.
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Ducommun Metals & Supply Company
4890 South Alameda, Los Angeles

"DIE-LESS" DUPLICATING

BENDER

BRAKE

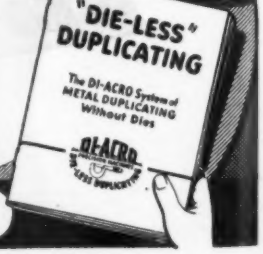
SHEAR

NO DIES!

DI-ACRO PRECISION MACHINES "DIE-LESS DUPLICATING" Pre-registered "DIE-ACK-RO"

"DIE-LESS" DUPLICATING might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines — Shears, Brakes, Benders — especially when used as a continuous, integrated production process.

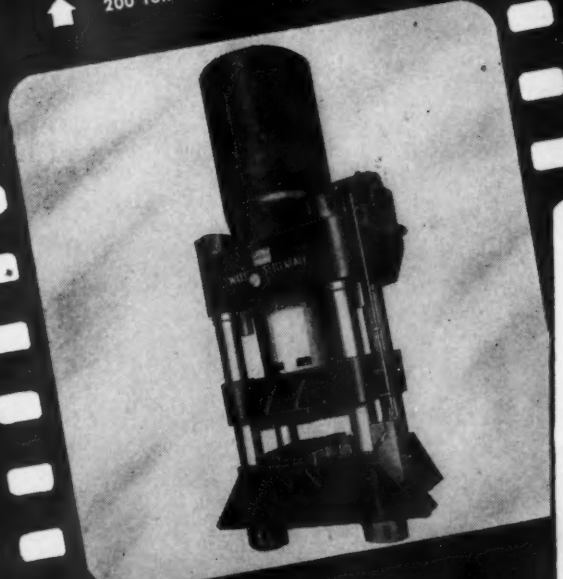
The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided, deliveries speeded up. *Write for Catalog.*



O'NEIL-IRWIN MFG. CO. 311 EIGHTH AVE. SO., MINNEAPOLIS 15, MINN.

Meet Tomorrow's Competition . . . with Speedy, Accurate, Low cost METAL FORMING

200 Ton Closed Side Forming Press



1300 Ton Forming Press

The Watson-Stillman Co. builds a complete line of single, double and triple action metal forming presses—Models and sizes are available for deep or shallow drawing or large heavy parts and for light gauge work.

A standard model W-S Metal Forming Press is available to meet the post-war demand for fast, accurate and economical production of formed metal parts and to lower the costs of your metal-working department.

W-S engineering will give you up-to-the-minute press controls, correct operating speeds, low maintenance, and versatile performance.

Your metal forming problems can be reduced through the correct selection of hydraulic press equipment. Investigate this possibility today. Write to the Watson-Stillman Co., Roselle, New Jersey.

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HYDRAULIC MACHINERY DIVISION

FACTORY AND MAIN OFFICE

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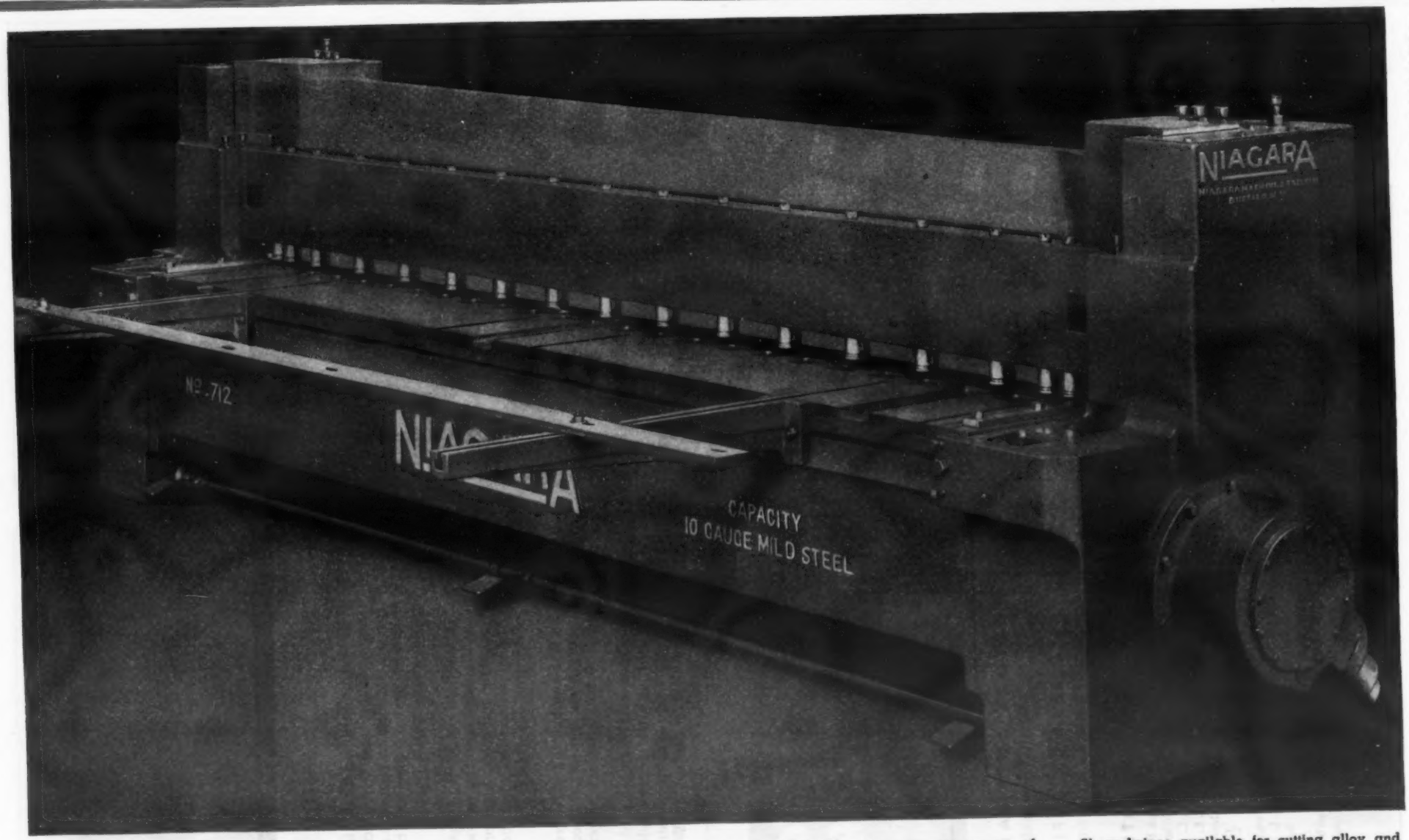


More production per man hour is being obtained in war plants using Niagara Power Squaring Shears. Convenient operation, quick, accurate setting of ball bearing, self-measuring parallel back gage, full visibility of cutting line, instant-acting Niagara sleeve clutch and complete accessibility at rear are some of their modern features. Built in a complete range of capacities and sizes. Niagara Machine & Tool Works, Buffalo 11, N. Y. District Offices: Detroit, Cleveland, New York.

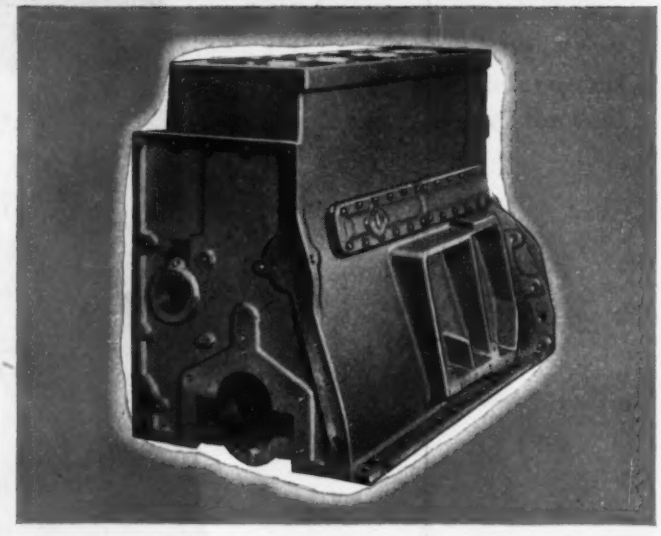
Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS

12 MINUTES *to Bore and Ream* CAM and CRANKSHAFT BEARINGS and DOWEL HOLES

Production Increased from 1½ to 5 Pieces per Hour with W. F. and John Barnes Unit-Type Machine

The combination of W. F. and John Barnes *standard* Hydraulic Sliding Head units and a *special* head for simultaneous boring of crankshaft and camshaft bearing seats and boring and reaming eight dowel holes enables this manufacturer to accomplish three-way boring and reaming of large tractor cylinder blocks in 12 minutes. Previous methods of boring and reaming required 40 minutes. Not only is there a substantial savings in machining time, but the Barnes Three-way Horizontal Machine increased production from 1½ to 5 pieces per hour. Tolerances are held to .001″ on the crankshaft and camshaft bearing seats, and .0005″ on the dowel holes.



• SPECIAL MACHINE PRODUCTION with STANDARD MACHINE FLEXIBILITY!

W. F. and John Barnes Unit-Type and Special *production* machines are designed and built from standard hydraulic feed and drive units. Barnes standard hydraulic units may be mounted in any position. By changing the tooling head they can be altered to compensate for design changes or machining other parts.

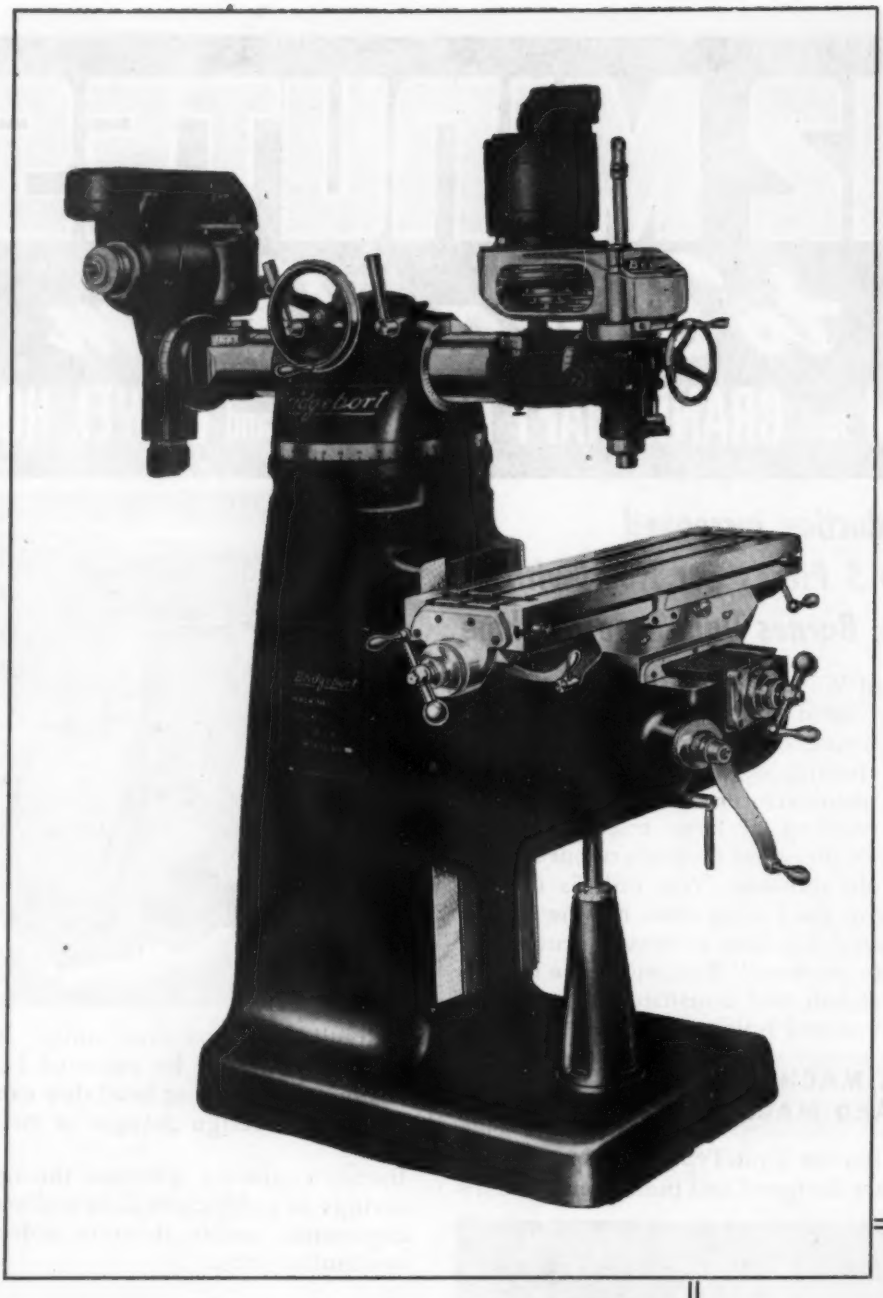
Barnes engineers welcome the opportunity to effect savings in production time and costs. Their years of experience enable them to solve intricate multiple machining jobs.

For detailed recommendations on your jobs, send blueprints of part specifying required production, operations to be performed, material and tolerances. There is no cost or obligation for this service.

TODAY Write for the W. F. and John Barnes SPECIAL MACHINE TOOLS Book — a looseleaf record of performance stories of Barnes Unit-Type and Special Machines in the field, together with other interesting, valuable data. Key production men can secure their copy FREE. Ask for Special Machine Tools Book Number 845.

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



Bridgeport TURRET MILLING MACHINE

Having made the nominal investment involved in installing Bridgeport Turret Milling Machines, you can be assured of high returns in the future as in the past because the versatility inherent in the "Bridgeport" makes it readily adaptable to any work within its range. A "Bridgeport" is always profitable because it will drill, bore, mill and shape at all angles on the same work set up. Ask for details.

The Bridgeport MACHINES, Inc.
Bridgeport, Conn.

Specifications

Longitudinal Feed—20"

Cross Feed—9"

Vertical Feed of Knee—16"

Standard Table—9" x 32"

Special Tables up to 48" available; also longitudinal power feed

Weight with Shaping Unit—2000 lbs.

Do it with DALZEN

Left: Dalzen taps, in U. S., Metric, Whitworth, and Special forms are precision-ground of hardened high speed steel in a complete size range. TUNGSTEN CARBIDE TAPS — EITHER SOLID OR INSERT—A SPECIALTY.

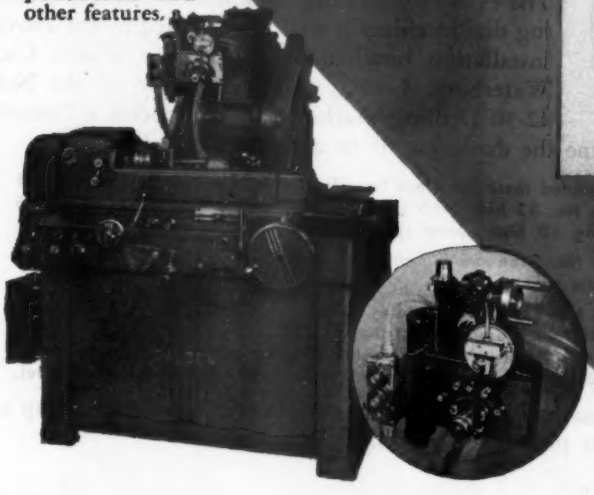
Left: High speed ground thread milling cutters, scientifically heat treated for longer cutting life

Dalzen manufactures an extensive line of precision cutting tools, parts, thread grinding and special machines — engineered for maximum efficiency and economical operation. Each is the result of years of experience on the part of designers and craftsmen. These are reasons why, all over the United States and in many foreign countries, master mechanics who have used and worked with Dalzen-made machines and tools say, "You can do it better with Dalzen." Write for details on how Dalzen can "do it better" for you.

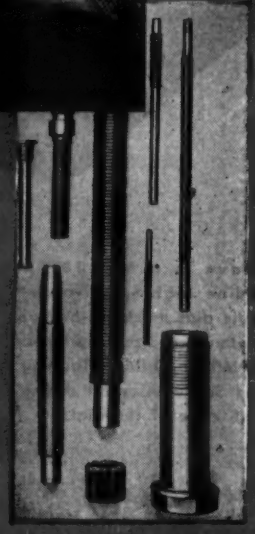
Below: Dalzen "2-in-1" combines a dependable, accurate center lapping machine with a sturdy drill press. Saves on equipment costs, floor space.

Below: No. 5 *Electronic* Thread Grinder. Easy to operate. High production efficiency and accuracy by controlled wheel speed, motor driven dresser, automatic compensation and other features.

Right: No. 2 Thread Grinder. Compact, upright design saves floor space. Simple to operate. Low first and maintenance cost. Ideal for short or production runs.



Right: Threaded parts are ground to close tolerances exactly to your specifications. Rigid inspection standards assure a uniform fine finish. Jobs requiring rolled or cut threads are also handled.



DALZEN

TOOL AND MANUFACTURING CO.

12255 EAST EIGHT MILE ROAD • DETROIT 5, MICH.

Bodine BATTERY
OPERATING ON THE HOME FRONT...

The extreme flexibility of Bodine automatic indexing dial machines is well high-lighted by the above installation installed in the Benrus Watch Co., Waterbury, Conn., where a battery of six No. 42-30 Drilling Machines which process a "rotor" used to time the explosion of an anti-aircraft shell.

Bodine adapted these machines for this specific job . . . Operation No. 1 being one No. 33 hole .160 thru the rotor and four No. 57 holes .045 deep, using 10 high speed spindles. Production 42 pieces per minute.

Operation No. 2 on another machine is the exact duplication of No. 1, the opposite side up.

Operation No. 3, using 4 spindles, drills one No. 36 hole .420 deep and one No. 49 hole the balance of the way thru the .437 dia. rotor. Production also 42 pieces per minute. Each machine has an inspector and either one or two operators (the latter speeding the cycle to 48 pieces per minute).

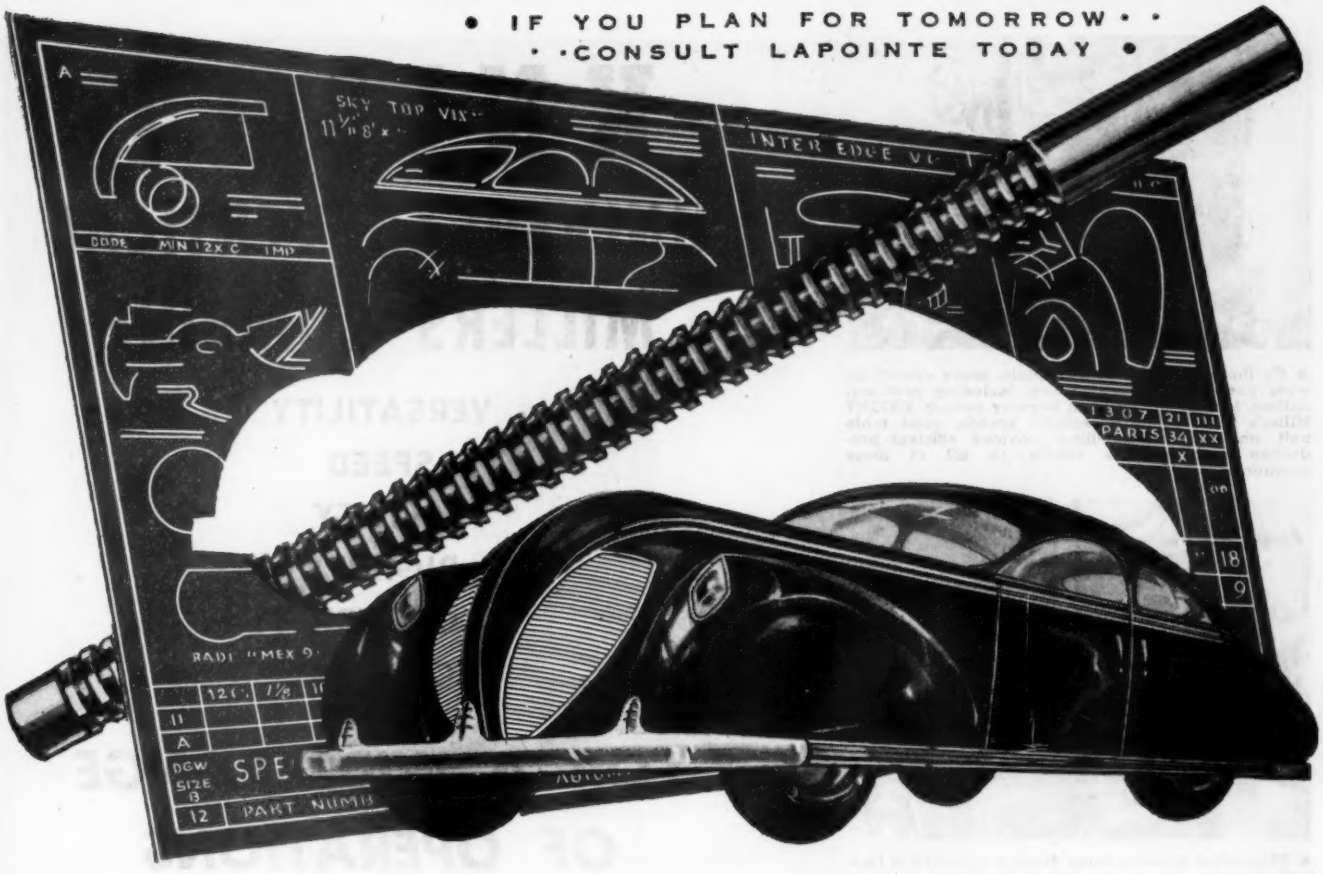
Ask Bodine engineers to recommend the machine and set-up to speed your production of small parts.

Above is a No. 48-30 Bodine high speed automatic dial machine—one of 6 standard sizes equipped for Milling, Drilling, Tapping and Screw Inserting during ONE cycle of the dial.

THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

Write for **BODINE DIAL MACHINE BULLETIN** . . . . showing 6 standard models.

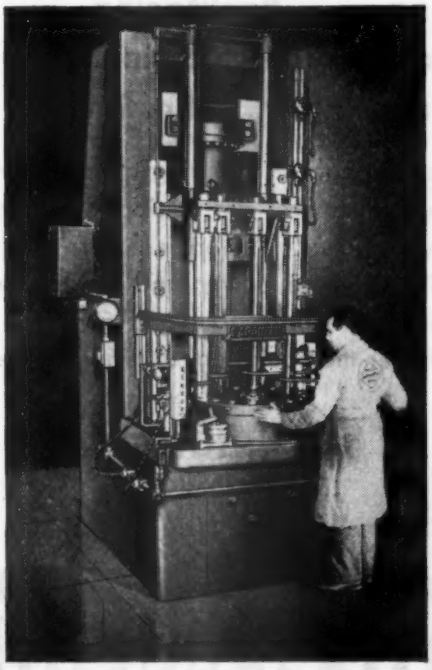
• IF YOU PLAN FOR TOMORROW • •
• • CONSULT LAPOINTE TODAY •



VISION ON WHEELS

Over tomorrow's broad highways will breeze four-wheeled marvels of mechanical perfection — speedy motor cars of modern beauty and luxurious comfort. In their making, the extensive use of broaching will assure the utmost in economical and efficient mass-production of precision parts.

Leaders in the automotive, aviation and home appliance industries, to mention but a few, are expanding their applications of Lapointe broaches and broaching machines — to step up production of their postwar products while keeping machining costs at absolute minimum. Likely, the Lapointe engineering staff will be able to point the way to important savings of time, money and floor space in your plant, too. You'll find it timely and wise to ask Lapointe to make a thorough study of your plant and product. Your request will bring action in a hurry.



Special V-7 with 4 broaches for finishing inside surfaces of propeller component.

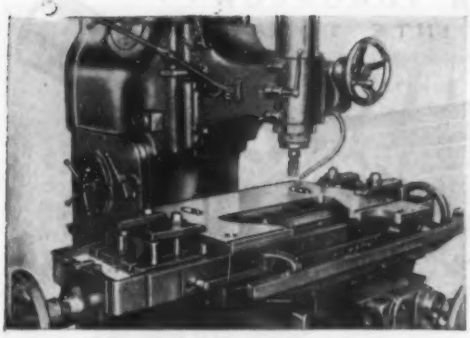
★ ★ ★ ★ ★ ★ ★

THE Lapointe

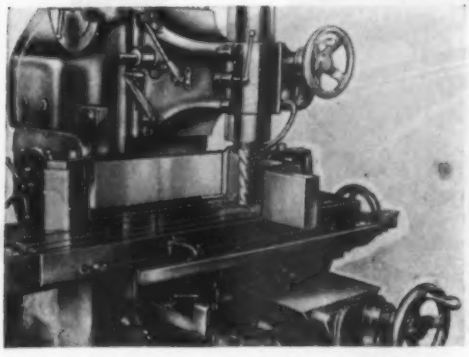
MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A.

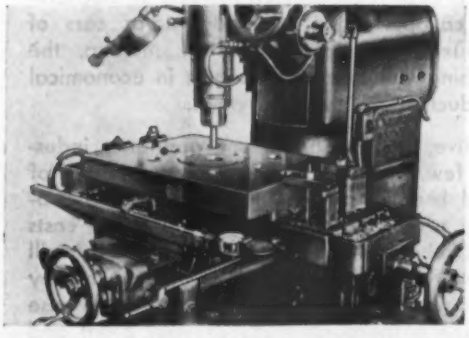
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES



• On the large one-inch steel plate, many operations were performed at one setting, including profiling, milling, boring, slotting, and keyway cutting. KNIGHT Miller's wide range of spindle speeds, solid table unit, and ease of handling provided efficient production and accurate results on all of these operations.



• Illustration shows a large forging on which a two-inch diameter cutter, six inches long, was used to remove as much as five-sixteenths inch of stock in some places without appreciable spindle deflection. The forging was machined completely all over and met with rigid inspection for finish and tolerances. A good, stiff job for any vertical miller and the KNIGHT took it.



• Handling a boring job on an eighteen-inch by twenty-nine inch plate, two inches thick. Nine holes, ranging from one and one-eighth inches to two-inches diameter, were accurately bored to limits of plus or minus .0005". Dial indicators for quick and accurate locating, a large accurately fitted spindle to insure round and straight holes, and table slides that are square made the KNIGHT Miller ideal for the job.

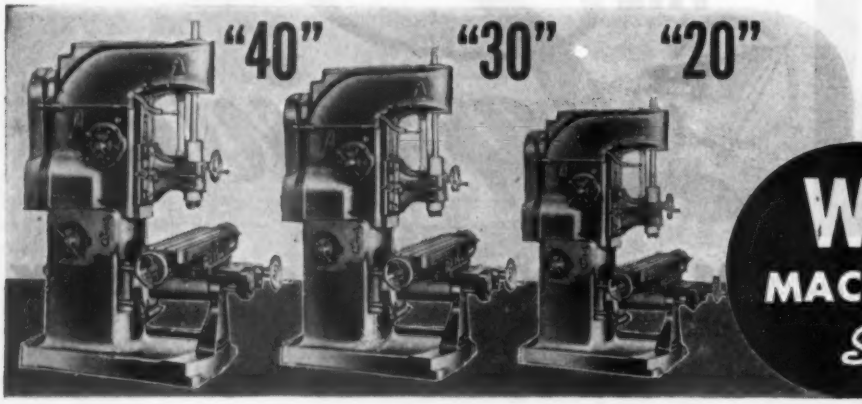
KNIGHT
UNIVERSAL VERTICAL MILLERS COMBINE

VERSATILITY
SPEED
ABILITY
RIGIDITY
ACCESSIBILITY
ECONOMY

FOR A WIDE RANGE OF OPERATIONS

Milling . . . Recessing
Boring . . . Shaping
Drilling . . . Routing
Turning . . . Backfacing
Surfacing . . . Slotting
Counterboring . . . Profiling

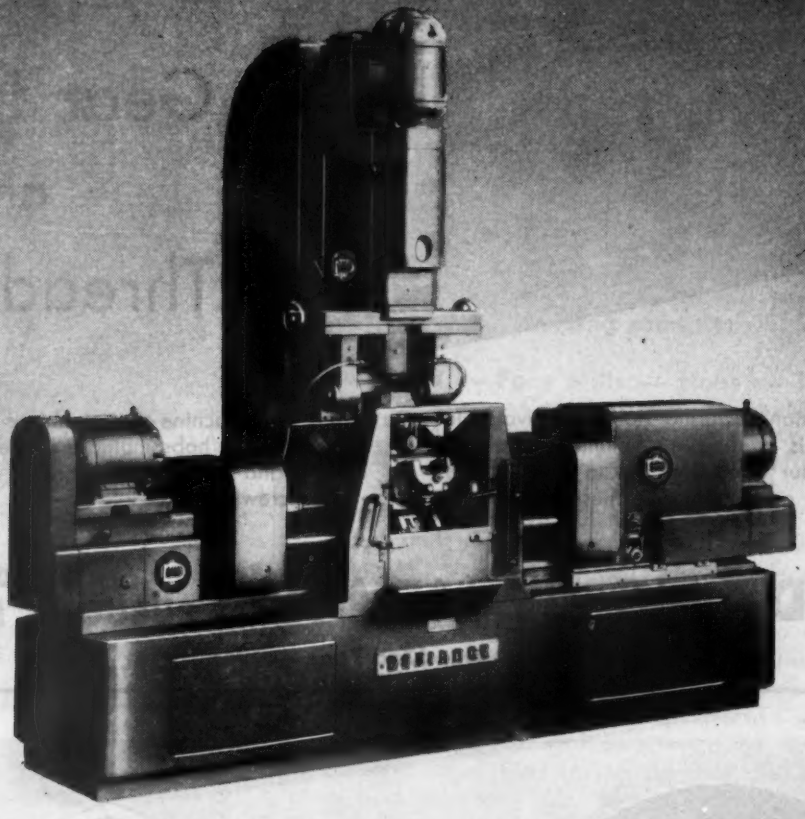
And you have the advantage of changing quickly from one job to another—at all times you are equipped for unusual capacity. Where speed and convenience are required, KNIGHT Millers deliver—where power and rigidity are required, KNIGHT Millers are fully able and give you more efficient operation, faster manipulation, and quicker set-ups.



KNIGHT VERSATILE MILLERS ACCURATE RIGID

W. B. KNIGHT
MACHINERY COMPANY
St. Louis 8, Mo.

HIGH PRODUCTION DRILL



● This three-way machine with five station indexing fixture shows the adaptability of Defiance Production Drilling Units to a production machine. These newly developed, greatly improved Defiance Cam and Hydraulic Units are available with standardized base and column design—for either horizontal or vertical mounting. Bases and columns are of welded steel to the dimensions required by the individual job . . . fixtures also specially designed for each job.

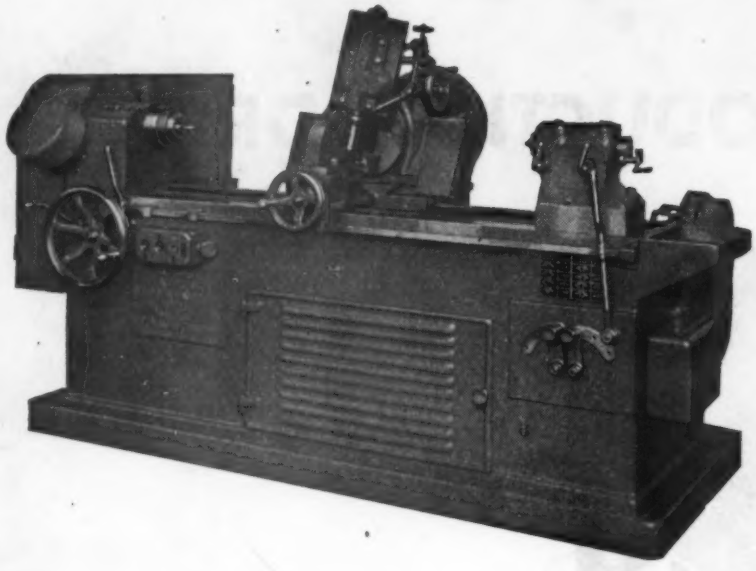
More and more shop men have learned through experience that Defiance-built Machines are "tops" in dependability, long life, and low-cost maintenance. Write for catalog.

Defiance Machine Works, Inc., Defiance, Ohio.

ARMY NAVY

DEFIANCE

BUILDERS OF PRECISION MACHINERY SINCE 1850



The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

THE ADAMS COMPANY

1905 BRIDGE STREET
DUBUQUE, IOWA, U.S.A.

1883 — Our 62nd Year — 1945

ARTER

Pre-requisite to grinding of this railroad piston ring is exact parallelism, and

ARTER

gives this plus versatility and simplification of operation.

ARTER ROTARY SURFACE GRINDERS

are available with chuck diametrical capacities from 8" to 40".

For your surface grinding, call on ARTER.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

Extra Versatility

WITH THE

OLIVER "ACE"

TOOL AND CUTTER GRINDER

This handy, accurate universal Tool and Cutter Grinder keeps the following types of tool in top-notch working condition:

Slab Mills — Face Mills — Hobs — Taps — Reamers — Spot Facers — Counterbores — Double Angle Cutters — Side Mills — Gear Cutters — Formed Cutters — Slitting Saws — Dovetail Cutters — End Mills — Helical Gear Cutters — etc.

"ACE" ADVANTAGES

SIMPLE—fewer attachments for regular run of milling cutters than any other similar machine.

ACCURATE—only one sliding part with ample bearing efficiently protected from dust.

HANDY—easy to set up; operator stands in natural position, work always in easy reach and plain view.

ECONOMICAL—its versatility makes it a truly "universal" tool conditioner.

Fast and accurate, easy to set up and simple to operate—the Oliver ACE Universal Tool and Cutter Grinder produces mathematically correct cutting teeth and edges on a wide variety of cutters and tools. It brings real economy to your Toolroom, too—for the Ace Grinder plus the two standard fixtures furnished with it, is sufficient not only for the general run of cutters and reamers, but for many types of difficult and special cutters. Inexpensive special fixtures broaden still further the range of work which the Ace will perform (Broach Grinding, Point Thinning, Tap Grinding, Radius work) "It's the Tops" for both large and small shops, for cutter reconditioning and cutter manufacturing. *Write for bulletin!* OLIVER INSTRUMENT CO., 1414 East Maumee St., Adrian, Michigan.

Illustration at *top of page* shows Oliver ACE with centers in position. Illustration at *right* shows adjustable head (equipped with Timken bearing) with taper for mounting spot-facers, counterbores, and end mills that need grinding on the end.

Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

KALAMAZOO Metal Cutting Band Saw

The most practical, convenient and efficient equipment for HIGH SPEED PRODUCTION in cutting off metal to lengths. Handles solids, tubes and all metals.

Compact coolant attachment eliminates messy floor pans, does not interfere with operation of machine and enclosed saw frame prevents all splash or drip on back travel. High grade pumping unit assures uninterrupted service and has ample capacity for any job.

Supplied without coolant for intermittent cutting. Portable—plugs in anywhere. Two sizes—8" x 16" and 8" x 24".

First choice of efficiency engineers. Ask your dealer or write for bulletin.

MACHINE TOOL DIVISION

KALAMAZOO TANK & SILO CO.
KALAMAZOO 16, MICHIGAN

In Canada—BRIDGE MACHINERY CO., MONTREAL.

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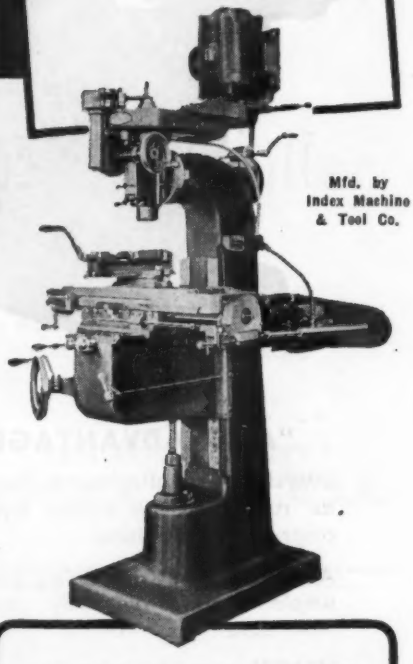
will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Machine & Tool Co.

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

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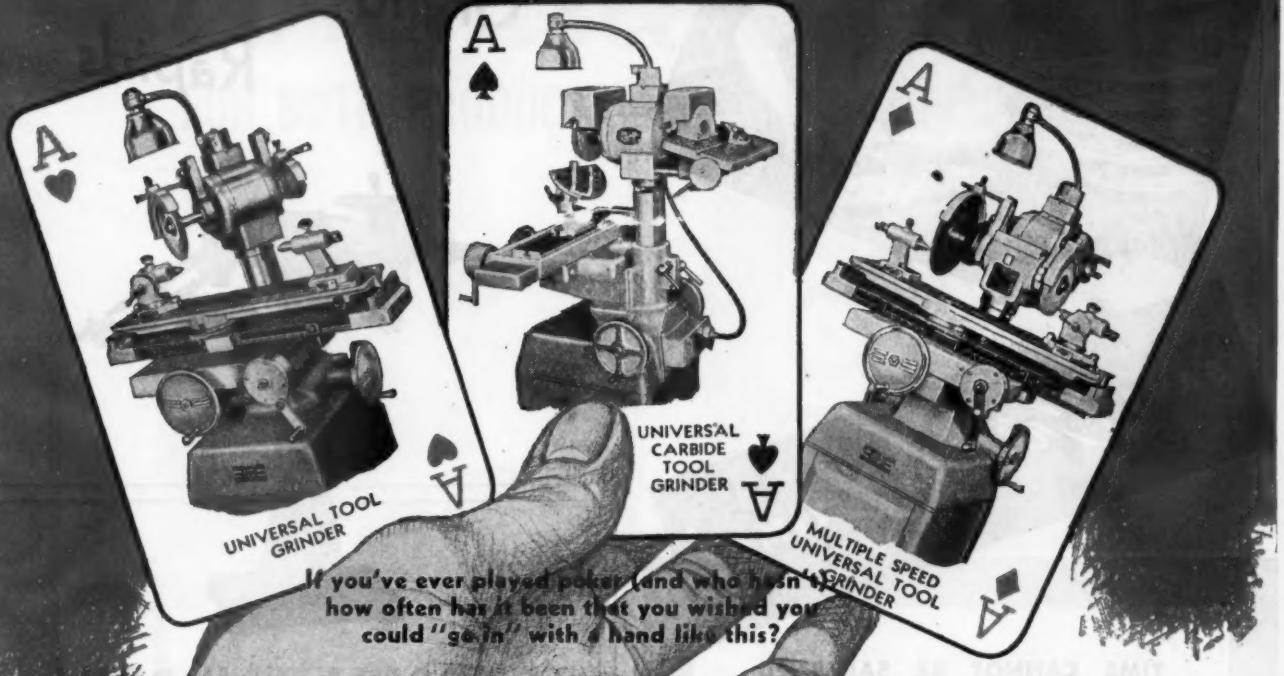
THREE ACES TO DRAW TO



If you've ever played poker (and who hasn't) how often has it been that you wished you could "go in" with a hand like this?

WE can deal you a hand like this—for your plant! *Knock-Out* Universal or Carbide Tool Grinders will prove to be the finest Aces anyone can deal you. They will pay their way and prove their worth many times over on tool maintenance or product production.

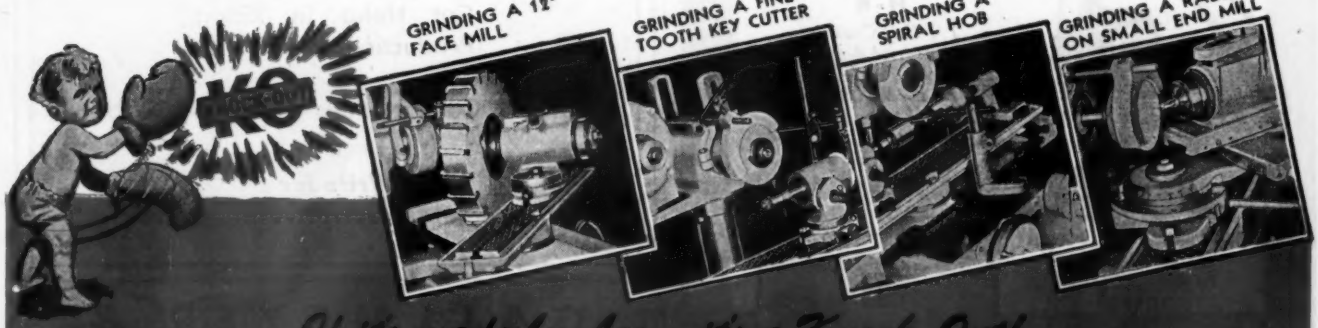
New and advanced features have given *Knock-Out* undisputed leadership in the Tool Grinder field. Versatility of operation and operator convenience have always been two prime factors in the minds of K-O Engineers. These, together with low initial cost and operation economy make K-O Grinders ACES—every one! Quick, easy setups on tools ranging from the smallest size to cutters twelve inches in diameter are made possible with K-O designed fixtures and accessories.

Correct machine design has placed operating parts where they will function with maximum performance and operator convenience. K-O Engineers have made available more time-tested fixtures and accessories than has any other tool grinder manufacturer, thus making K-O Tool Grinders truly universal. Single-speed or Multiple-speed motor heads are available. The K-O SPEED HEAD permits the operator nine speeds from which to select for the job at hand. These speeds range from 1,100 to 11,000 R.P.M.

Knock-Out Universal Tool Grinders are built to accommodate most any high-speed steel cutters as well as carbide tip tools. K-O Carbide Tool Grinders are built to handle all grinding and sharpening operations necessary on single point carbide tip tools or, if desired, for grinding chip breakers only.

Thinking men are now planning for reconversion. Let us tell you how to include these "three Aces" in your plans.

See your nearest *Knock-Out* Distributor or write now for catalogue No. 28-65.



If it's made by Lee—it's a Knock-Out!

SEE YOUR NEAREST DISTRIBUTOR OR WRITE DIRECT TO

K. O. LEE CO. ABERDEEN, SO. DAK.

SAVE *Critical* TIME!

TIME CANNOT BE SALVAGED

Once it's gone there's no reclaiming it. But you can cut your finishing time 'way down with Haskins Flexible Shaft Equipment. Forget old hand-finishing methods. Your men will work faster and better, with less fatigue, the Haskins way. Every hour will see increased production. Man-hours—plus machine-hours—will really mean something. For important new time-saver methods, send for your copy of Catalog 45. R. G. Haskins Company, 2760 W. Flournoy Street, Chicago, Illinois.

H-6

1/2 H.P. Countershaft drive, 4-speed —900—3400 R. P. M. Bench height pedestal mounting, 360 degree swivel.

HASKINS Flexible Shaft EQUIPMENT

Grand Rapids

COMBINATION DRILL AND TAP GRINDERS

Model 10-B

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

"Sharp Drills and Taps Cut Holes in Rising Production Costs."

Other Combinations Also Available

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300 Straight Ave. S.W.

GRAND RAPIDS • MICH.

Versatile . . .

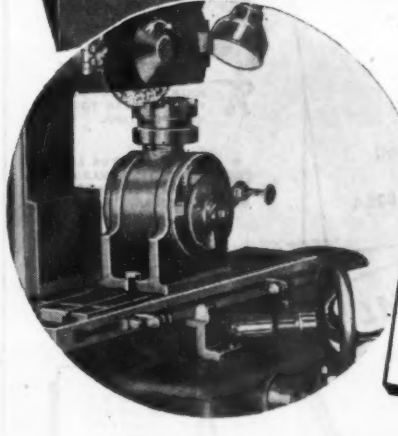
FOR BOTH PRODUCTION AND TOOLROOM JOBS!

That's the

COVEL No. 15

SURFACE GRINDER

(6"x 18")



On a typical precision job, the COVEL No. 15 is shown here grinding clutch teeth. The work-holding fixture is hand-operated, moves the clutch blank around as each cut is finished. Work table is 6"x18", ample to hold most work pieces suitable for this type grinder. Table moves up to work. Wheel cannot fall into work and ruin the finish.

Most plants today need a hand-feed precision Surface Grinder built for double duty—on the production line and in the toolroom. And that's the spot the COVEL No. 15 is designed to fill!

Quick set-ups and simple hand control reduce operating time to a minimum. Change-over from one job to another can be made quickly and easily—a feature that means bigger profits on short runs for you!

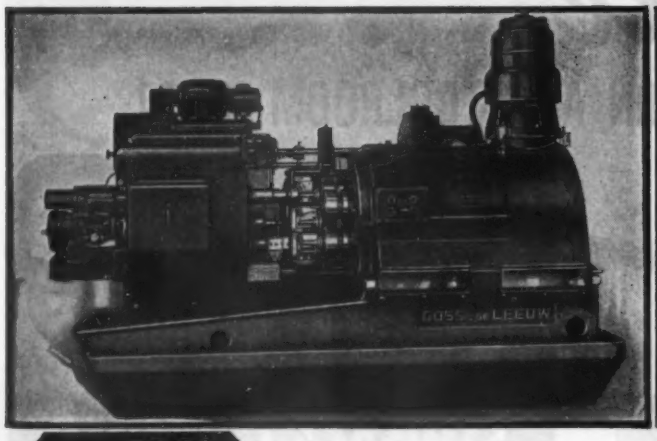
Toolroom savings result because of the wide range of uses and accuracy of the COVEL No. 15. Tolerances of tenths of thousandths are everyday standards for this reliable machine—your assurance of precision workmanship on such intricate work as dies, threading chasers, V blocks and angular bars. Find out more about this versatile Surface Grinder and how it can pay its way in your plant. *Write for Bulletin A165 today.*

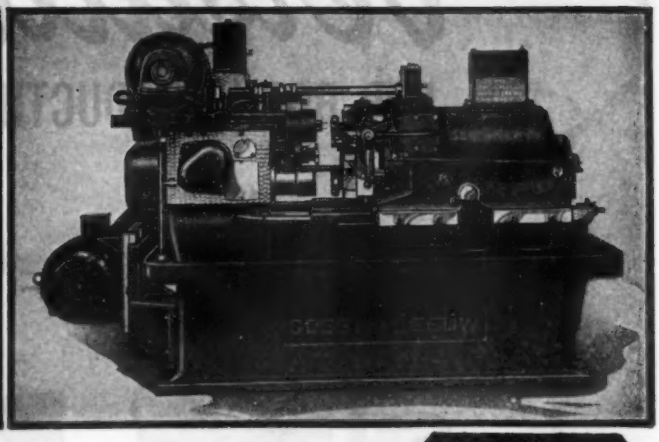
GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

MOREY TURRET LATHES
for BAR *or* CHUCKING { UNIVERSAL or PLAIN

 # 3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

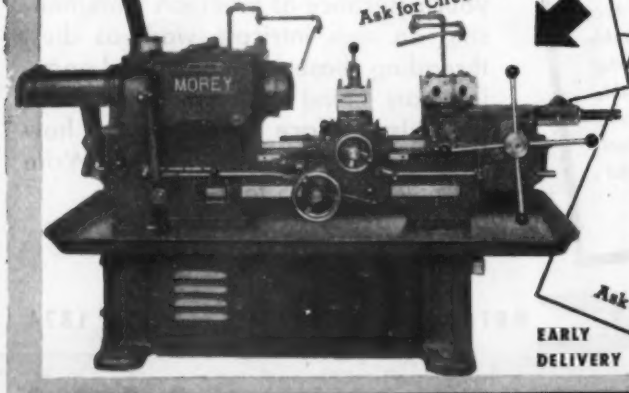
 # 2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

 # 4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM. constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
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PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

SAVING 62% OF *Time* MEANS PROFITS

"Says Stop-Watch Pete of BAUSH"

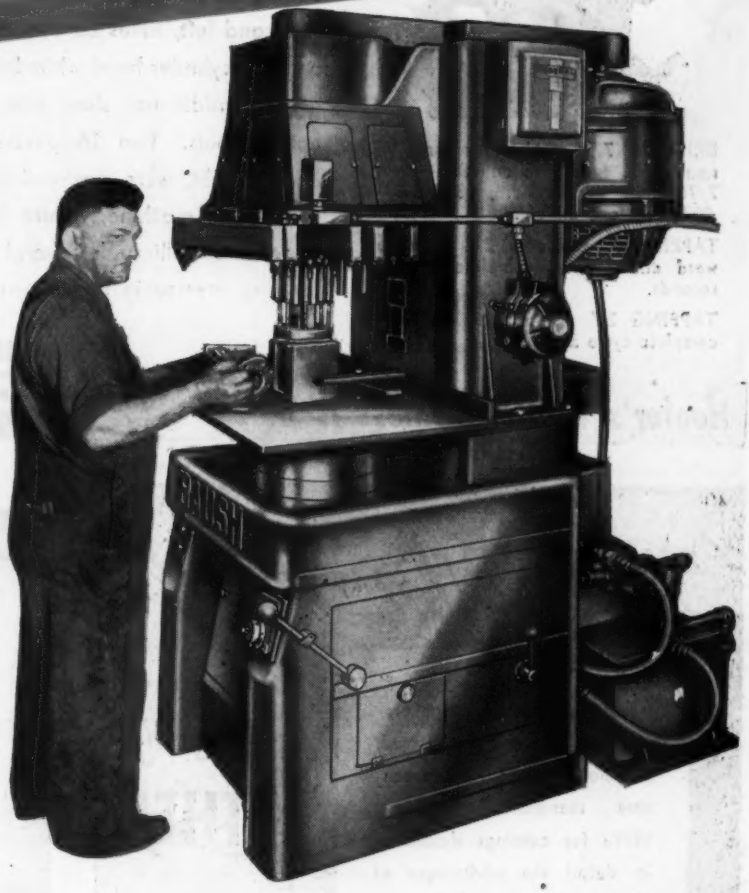
Installation of this Baush Vertical TF Multiple Spindle Drilling Machine in one of the largest valve plants in the world stepped up their production from 46 pieces per hour to 120 pieces per hour—a saving of 62% of labor and machine operating time over previous methods.

Would time-saving like this interest YOU?

A phone call—a wire—or a letter outlining your drilling, tapping, boring or reaming problems to us may show *you* how to save TIME and increase profits.

Leaders in designing and building multiple spindle machine tools—Baush experience can help you solve such problems and meet present and post-war competition.

Descriptive literature sent upon request

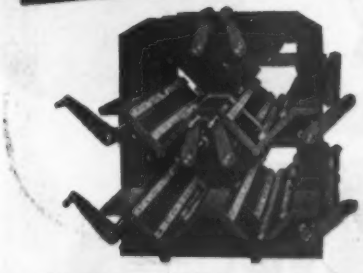


Drilling eight 7/16" diameter holes in one operation, in bolted cap flange for 2" all-iron gate valve, increased production from 46 pieces per hour to 120 pieces per hour.

BAUSH MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

Stop-watch timing showed these eight 7/16" drills to be running at 622 RPM at 70 surface feet per minute—actual drilling time 8½ seconds with table feed rate of 2½" per minute. Complete operating cycle—loading cap flange into jig fixture, drilling and unloading—was clocked at 21 seconds.

HOEFER Two-Deck Fixture Speeds Machining ..Drilling and Tapping.... of 3 different sized cylinder heads for Diesel Motor



DRILLING 7/16—55' per minute, 475 r.p.m. .006 feed, one minute. 7/16—56' per minute, 390 r.p.m. .007 feed, one minute.

TAPPING 21' a minute, 213 r.p.m. forward and reverse, complete cycle 30 seconds.

TAPPING 22' per minute, 173 r.p.m. complete cycle 30 seconds.

★ The view at left is of tunnel fixture designed to handle the drilling and tapping of three different sized cylinder heads on Diesel Engines, for bolting on flanges of manifolds. The upper deck, right and left, takes care of drilling and tapping one size cylinder head while lower deck takes care of two additional sizes with identical manifold hole layouts. Two 16-spindle heads, similar to one at right, were mounted on opposite ends to a two-way machine, fixture in the middle, right hand end drilling, left hand end tapping, with tapping reverse in machine—positive lead screw.

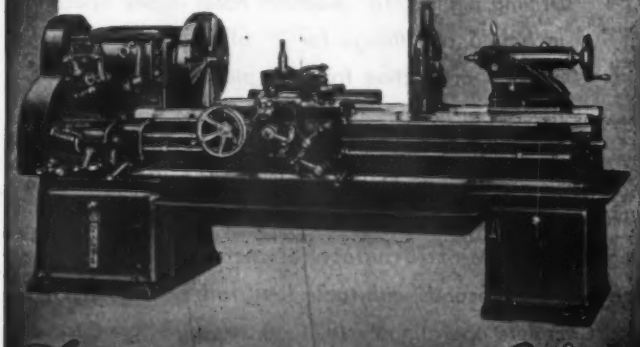
When you have more than one hole to drill, let HOEFER help you drill them to get the utmost in time savings and economy.

Hoefer's Whole Business is Holes.... **HOEFER MFG. CO.** *Freeport, Ill.*

Metalmaster

12", 14" & 16" LATHES

• Fast, accurate for war production ... durably constructed, precision built to meet peacetime manufacturing needs. Write for catalogs describing in detail the advantages of METALMASTER Lathes.



The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES ... IN BUSINESS SINCE 1840

659 EVANS AVE. ... CINCINNATI, OHIO

Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES

The rugged, special analysis castings of Logan Lathe beds are alloyed to obtain the finest characteristics, and designed for sections of even thickness to reduce internal strains. How these rugged castings are planed, aged, milled, machine scraped, finish milled, precision ground and checked is a complex story of accurate, efficient workmanship. The aging period which follows the rough cut, for example, allows more than adequate time for maximum development of any latent tendencies to distortion. In milling, nine formed cutters perform nine heavy milling cuts simultaneously in a single pass to bring the ways to within .0015" of finished specifications. Mechanical scraping, finish milling and final precision grind bring the ways to within .0005" of parallelism. Care like this, not only in making the bed, but in building the complete machine, makes the Logan Lathe accurate in the tool room and in high speed production. Ask your Logan dealer, or write for catalog information. E-4

No. 820 Quick Change Gear Lathe.

SPECIFICATIONS common to all Logan Lathes: Swing over bed, 10-1/2"; Bed width across ways, 6-15/16"; Bed length, 43-1/8"; Size of hole through spindle, 25/32"; Spindle nose diameter and threads per inch, 1-1/2"—8; 12 Spindle speeds . . 30 to 1450 r.p.m.; Size of motor . . 1/3 or 1/2 h.p., 1750 r.p.m.; Preloaded precision ball bearing spindle mounting; Drum type reversing motor switch and cord; Precision ground ways, 2 prismatic "V" ways, and 2 flat ways.

LOGAN ENGINEERING CO.
CHICAGO 30, ILLINOIS

Geargrind Announces

FORMSPRAG

THE FULL COMPLEMENT

Over-Running Clutch

The FORMSPRAG consists of inner and outer members which form a cylindrical, annular space completely filled with spring energized sprags. ¶ Torque is delivered through many points of contact, with an infinite number of "stations". Once torque is removed the sprags release—instantaneously. ¶ This simple design permits the greatest possible torque capacity for size and weight.

For full information, write for folder, and outline your requirements.

The GEAR GRINDING MACHINE COMPANY

DETROIT 11, MICH. U.S.A.

Save Time ... Cut Costs

THE PORTER-McLEOD IS THE MACHINE FOR URGENT NEEDS IN HIGH PRODUCTION CUTTING

The 8" Porter-McLeod Cold Metal Sawing Machine provides a high speed, high production means of cutting stock from 3" up. Its capacity is 8" round and 7½" square stock. Provision is also made for the nesting of bars or shapes so that multiple units can be cut at one time.

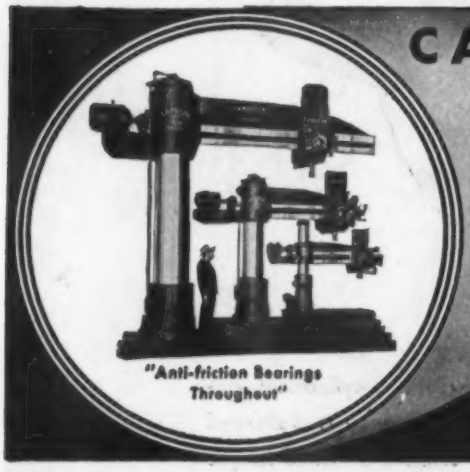
Production can be stepped up tremendously by this machine because of unique features of design. For example, the blade is supported close to its rim and pulled through the cut. Buckling of saw is thus prevented and accuracy maintained. This method of support and drive assures longer blade life, straighter, cleaner cuts, faster cutting and less power. Blades are designed so that every tooth cuts, a further contribution to speed.

Send at once for Description Bulletin, giving full and complete details on this machine which meets every requirement for solving today's high production problems in cold metal sawing.

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U.S.A.

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

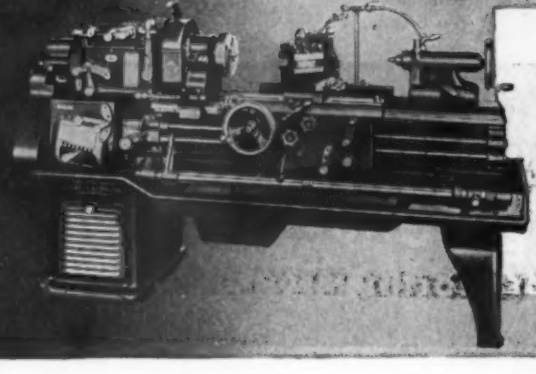
The **CARLTON**

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U.S.A.

ARMY E NAVY

CINCINNATI LATHES



Performance is Consistently Accurate

Regardless of the job being machined, CINCINNATI LATHES can be depended on to produce work of highest quality with speed, convenience and precision. Consistent performance on your requirements is assured by the wide variety of tooling possibilities available. Sizes: 14" to 30". Latest literature illustrates and gives principal dimensions of the sizes in which you are interested. *Send for it.*

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

"Seek and Ye Shall Find"

I'm agin it!

A high grade Tool Room or Engine Lathe must be designed to do all tool room work within its capacity, and also produce the finest gage work quickly and accurately—*but then what?*

Here at Hendey, we have always felt that the *simplification of controls* was almost as important as the machine itself. That's why we did something about it years ago. That's why you can always spot a Hendey Tool Room Lathe operator. He's satisfied because his machine has a *minimum* number of operating levers—every one within easy reach; every one actuated by a "natural motion." It all adds up to an easier, more productive, more profitable day's work for him and you too.

Hendey has taken care of maintenance points in the same way. Wherever possible, oil reservoirs are used. The carriage apron is entirely enclosed, even to the rack pinion. Access doors are provided where necessary, but don't swing so wide as to take three times the floor space required by the lathe itself.

Yes, "We're agin" Biblical "Seek-and-Ye-Shall-Find" methods. You will be too—after trying a Hendey on your tool room and engine lathe jobs.

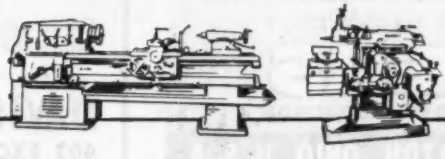
The Hendey Machine Company

Hendey

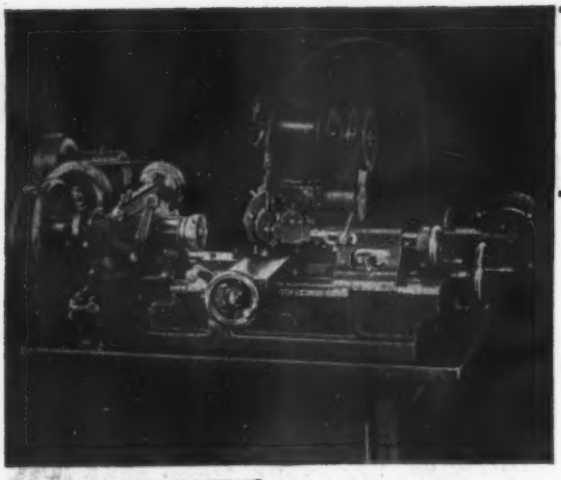
Main Office and Plant — Torrington, Connecticut

Branch Offices — New York, Chicago, Boston, Detroit, and Rochester

Representatives in — Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco



TOOL ROOM LATHES SHAPERS



WALTHAM THREAD MILLERS

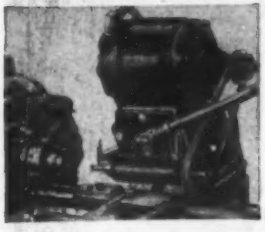
provide versatility and precision in small thread production

Designed especially for small work calling for close tolerances, WALTHAM THREAD MILLERS can be depended on to meet the most exacting specifications for precision parts.

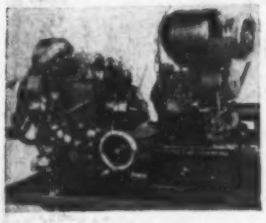
An outstanding feature of these improved machines is the use of three motors, one each for driving cutter, work and pump. Machines can be arranged with speeds suitable for brass or steel or both. Motors are wired so that a single start and stop station will control all at one time.

Standard equipment includes three motors with control, follow rest, milling cutter, indexing device, 5 pitch lead screw and change gears for cutting from 5 to 40 threads per inch.

A wide range of special equipment is available and greatly enlarges the usefulness of this machine. Full details on request. Write for Bulletin 244A.



(Left)—Waltham Thread Miller equipped with Internal Threading Attachment.



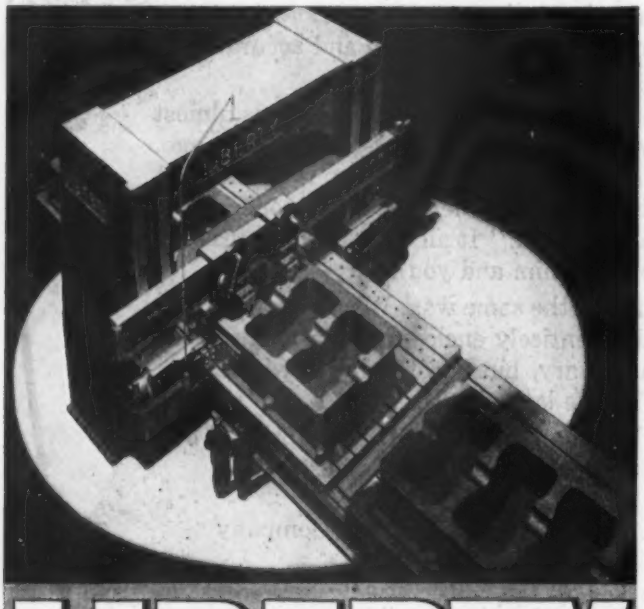
(Below)—Waltham Thread Miller equipped with Relieving Head.

CONDENSED SPECIFICATIONS

Swing over carriage—3"
Dia. work handled—2" or smaller
Thread length (work held on centers) —8¾"
Thread length (work held in chuck)—10"
Max. Dist. between centers—12"
Floor Space—48"x34"
Net Weight—850 lbs.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

WALTHAM
MACHINE WORKS,
WALTHAM, MASS.



LIBERTY

SMALL, MEDIUM AND HEAVY DUTY
PLANERS
FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.
Over a Quarter-Century of Specialized Experience with Time Tested Principles of Design

KEYSEATING
The Modern Way

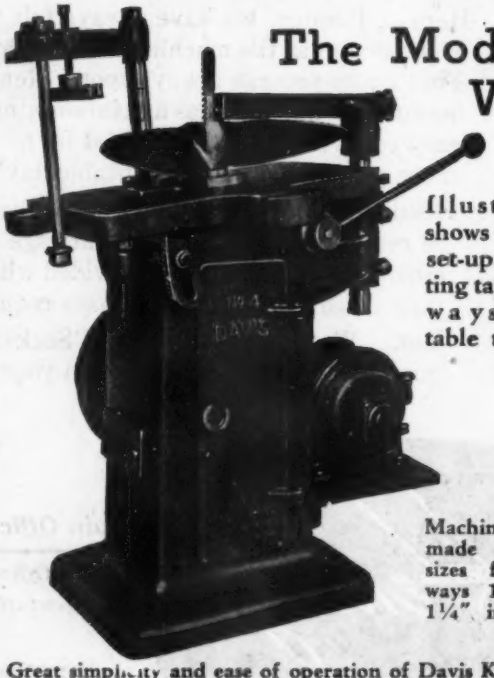


Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

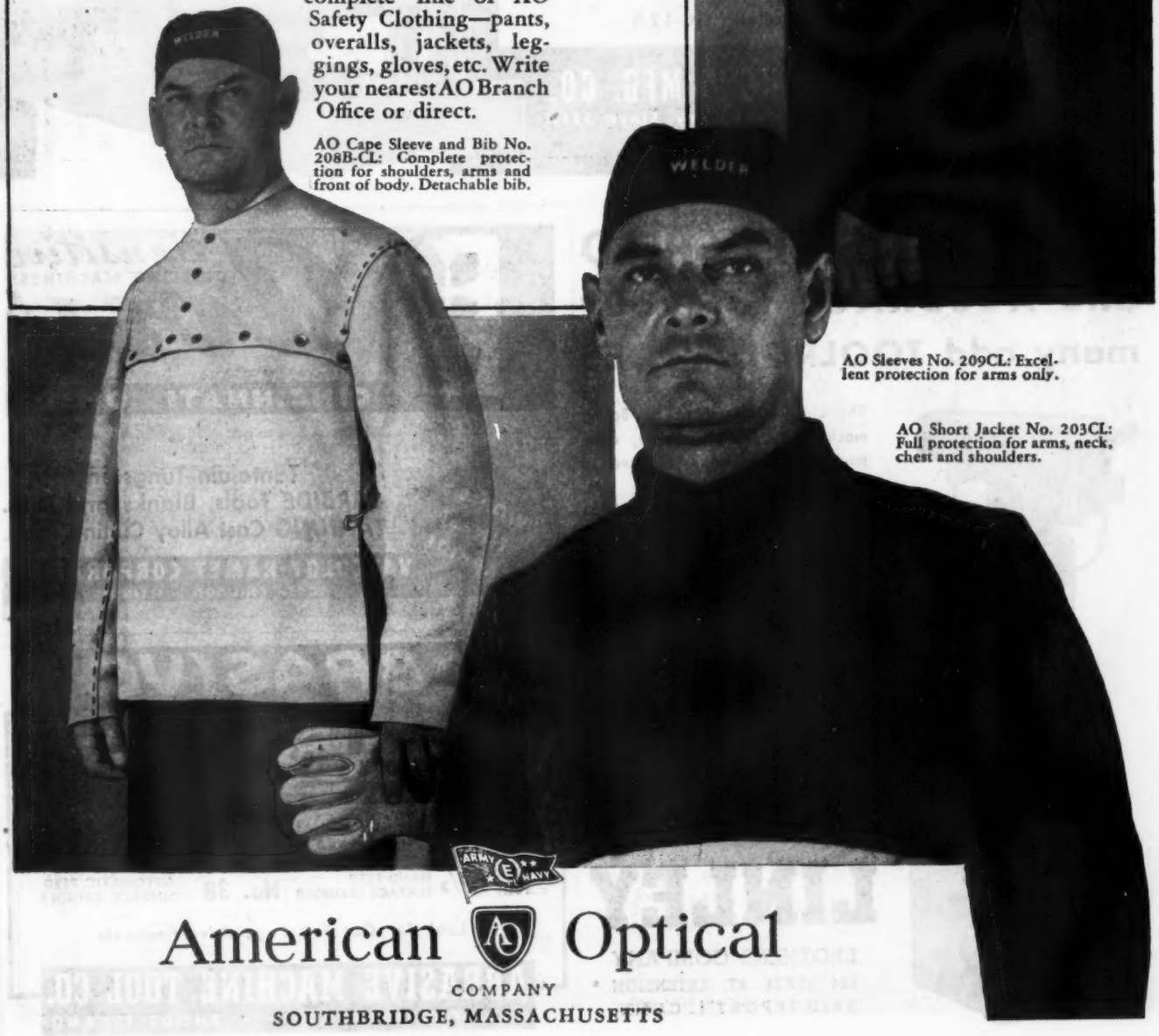
DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

Welders Work More Comfortably—More Efficiently in

AO SAFETY CLOTHING

These welders are ideally dressed for bench welding, cutting and burning during the hot months. Cut for free action out of high-grade chrome tanned leather, each of the garments provides ample protection for the exposed parts of the body without adding uncomfortable weight for unneeded coverage. Send for catalog showing complete line of AO Safety Clothing—pants, overalls, jackets, leggings, gloves, etc. Write your nearest AO Branch Office or direct.

AO Cape Sleeve and Bib No. 208B-CL: Complete protection for shoulders, arms and front of body. Detachable bib.



AO Sleeves No. 209CL: Excellent protection for arms only.

AO Short Jacket No. 203CL: Full protection for arms, neck, chest and shoulders.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

"Our Tool Makers Still Talk Enthusiastically about Our GEMCO Shaper!"

A well-known mfr. of Circuit Breakers writes us: "We have had our GEMCO Shaper about a year, and our tool makers are still talking enthusiastically about it."

The Universal Type of GEMCO Shaper, shown at right, is ideal for tool and die work, or where angular work set-ups are required. Its time-tested features are:

1—Sturdy, powerful construction; 2—Utmost precision in workmanship and performance; 3—Dependability under continued severe service; 4—Ease and convenience in operation; 5—Advanced type of force feed lubrication; 6—"LUBRIGARD" Safety Device increases the Precision Life.

Write Today for Bulletin GC-12A

GENERAL ENGINEERING & MFG. CO.

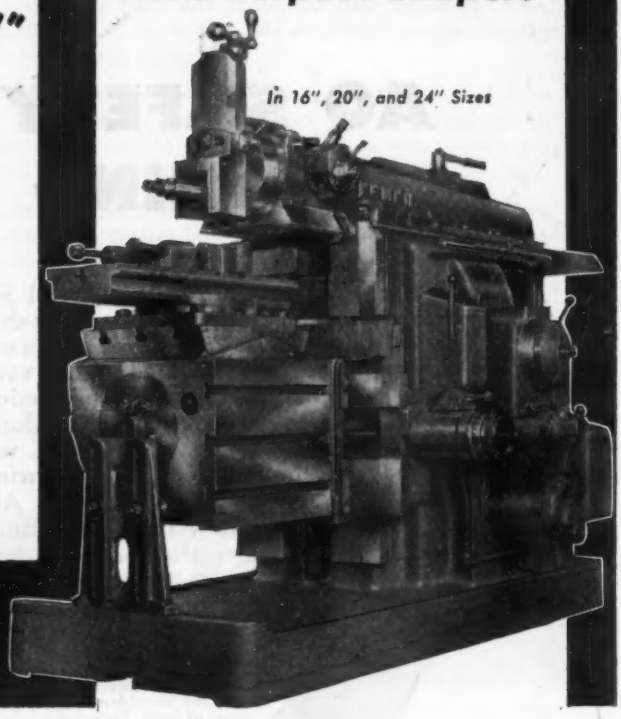
Manufacturers of Precision Machinery Since 1917

ST. LOUIS 4, MISSOURI

GEMCO

Multi-Purpose Shapers

In 16", 20", and 24" Sizes



The Right SIZE, SPEED and ACCURACY for your many odd TOOLROOM JOBS

The Linley Milling and Jig Boring machine is a multi-purpose, compact unit specifically designed to handle small die making jobs, models, metal patterns, jigs and the related operations of a busy shop.

Its rigidity, smooth feed, 8 spindle speeds (to 4250 r.p.m.), direct micrometer setting, easy set-up and changeover, provide the speed and accuracy to keep the decks cleared . . . and at the same time earn generous profits.

Save toolmakers' time, save larger machines for their rated work, save space on congested floors.

ASK FOR BULLETIN

LINLEY

BROTHERS COMPANY

664 STATE ST. EXTENSION

BRIDGEPORT 1, CONN.

Avey Sensitive DRILLING MACHINES

CINCINNATI OHIO

"WORLD'S FINEST CARBIDE"

Tantalum-Tungsten *CARBIDE* Tools, Blanks and Dies.
TANTUNG Cast Alloy Cutting Tools.

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO · ILLINOIS

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. IG	INTERNAL GRINDER	No. 34	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	No. 3B	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.

EAST PROVIDENCE 14, RHODE ISLAND

"GREENFIELD MAN" SHOWS HOW TO ELIMINATE THREADING BOTTLE-NECK WITH "ACORN" DIE

[A GTD SHOW-HOW REPORT]

1 A "Greenfield Man" on a routine service call at a large plant in New York State was told by the Tool Supervisor that they had to finish threading a certain part by hand because the threading operation on the turret lathe was producing tapered threads. "It is a major headache," said he.

2 "That looks like a 'natural' for one of our 'Acorn' Dies," said the "Greenfield Man". He located an "Acorn" Die Releasing Type Holder in another department which he adapted to fit turret of machine by having shank ground down from ¾" to ⅝".

3 While shank of holder was being adapted to fit turret, the "Greenfield Man" phoned local "Greenfield" Distributor and asked him to send over two "Acorn" Dies from the distributor's stock right away.

4 Before the "Greenfield Man" left the plant, this emergency "Acorn" Die set up was running smoothly producing perfect threads, and an order was placed for the correct size holder

Results!

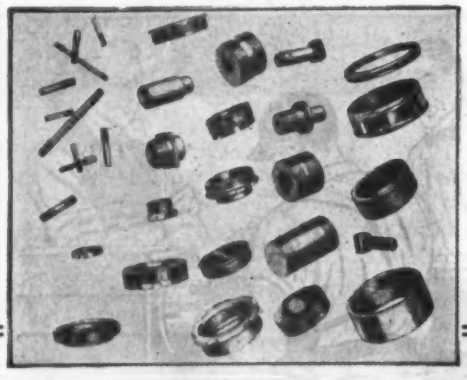
A needless operation was eliminated. Production time was cut to a fraction and a serious bottle-neck eliminated. Value of on the spot show-how service by "Greenfield Man" and quick delivery from stocking "Greenfield" Distributor was demonstrated.

Greenfield's SHOW-HOW is KNOW-HOW in action!

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD : MASSACHUSETTS

Any parts that can be chucked can be threaded on the COULTER HOB THREAD MILLER



. . . a universal machine for automatic production of internal or external right or left hand threads

Hob Threaded work can be handled with speed and precision on this rigid, simple fully motorized machine. The variety of work it is capable of handling is almost unlimited because any parts that may be held by chuck or special fixture can be threaded. The design of this machine is such that long work can also be accommodated.

Work and cutter spindles are each driven by individual motor, a wide range of speeds and feeds being available for threading of parts of various materials. Once the machine has been started on the first piece, the entire operation is automatic until time for unloading.

Explore the possibilities of the "Coulter" on your external and internal threading by writing for further information.

THE JAMES COULTER MACHINE CO.
BRIDGEPORT, CONNECTICUT

REID for precision plus!

SIMPLICITY
DURABILITY
CONSISTENCY
ECONOMY

REID SURFACE GRINDERS are of heavy, rigid *stress-proof construction* for smoother work finish.

Centralized controls assure ease of operation - - - - simple, well balanced *design* for longer care-free duty. Whether for precision production work or tool room precision work REID GRINDERS are built to do the job *RIGHT*! - - - - - - - - - - Send for catalog and price list today.

REID BROTHERS COMPANY, INCORPORATED
BEVERLY, MASSACHUSETTS

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** Units

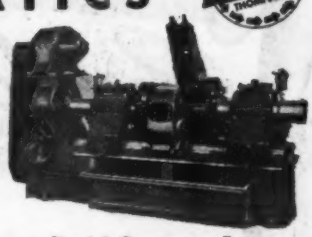
½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Horizontal ROTO-MATICS

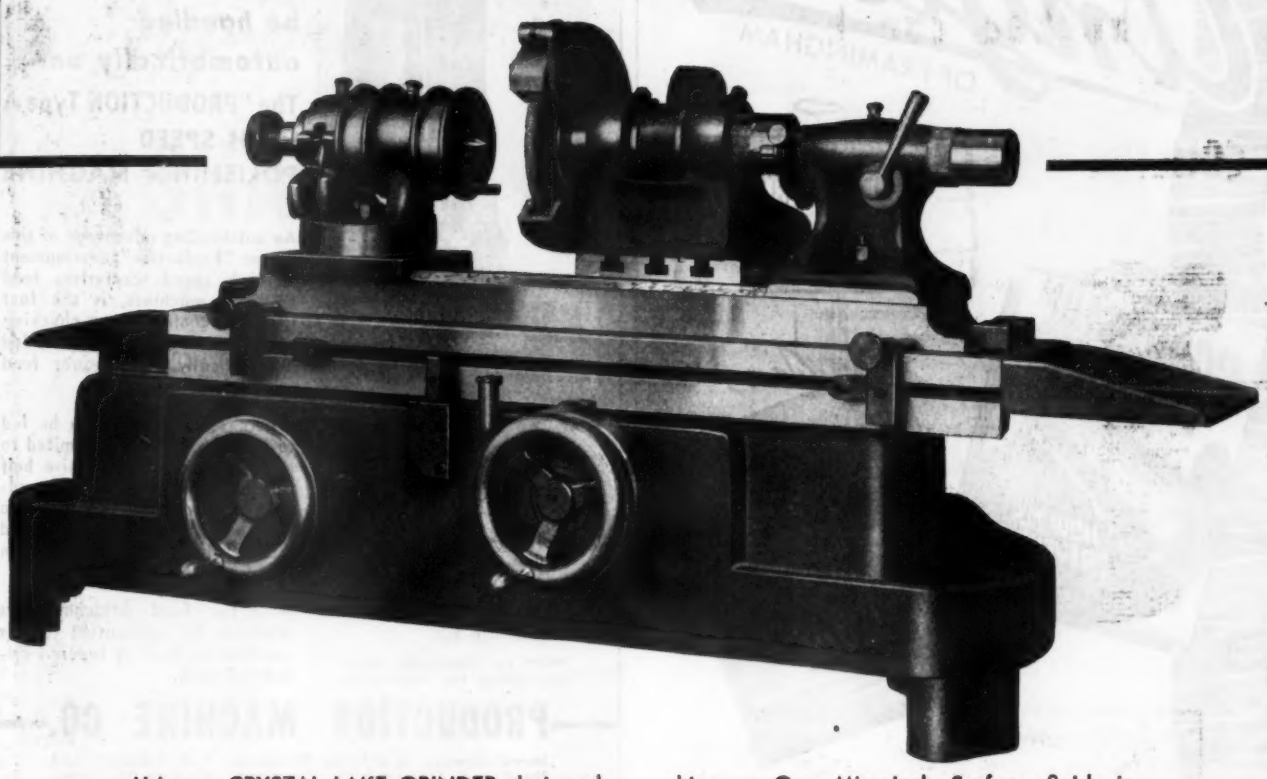
When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. *Bulletins 110 and 120* are available for suggested solutions to your problems.



No. 1-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

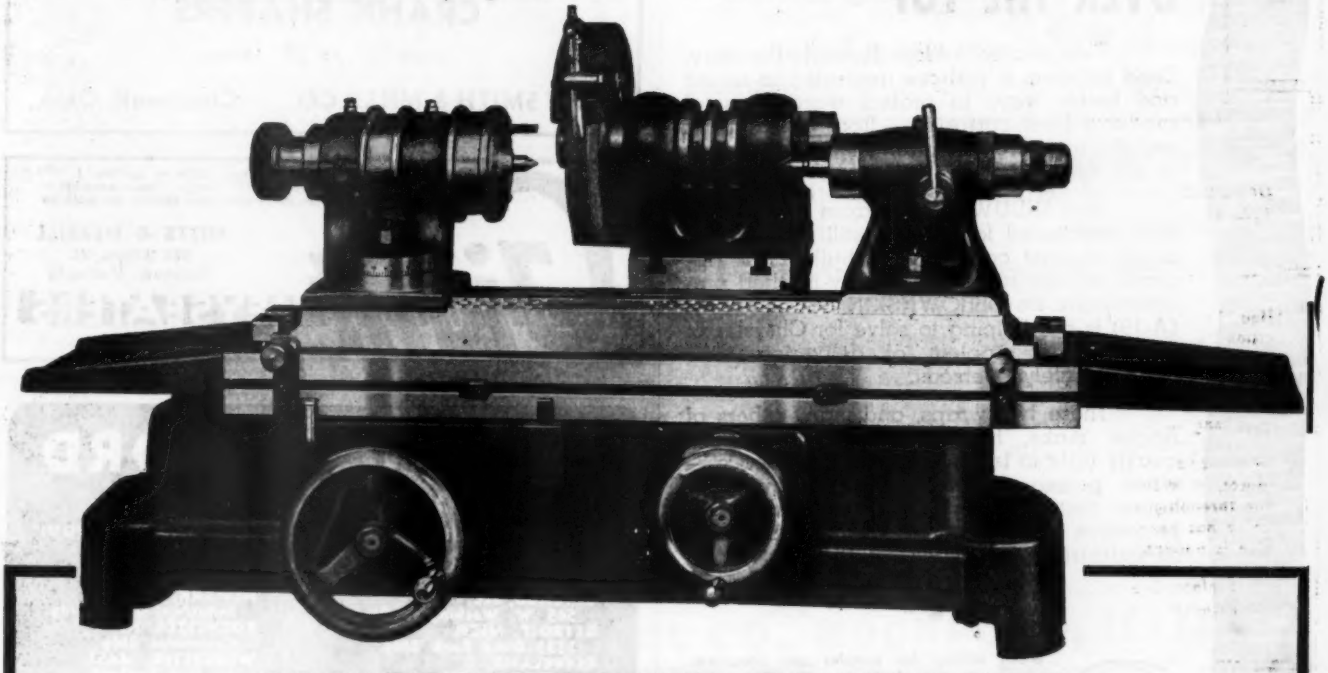
ATTENTION! GAUGE MAKERS



Using a CRYSTAL LAKE GRINDER designed with double taper, time-tried bearings since 1910, you can grind your gauges both parallel and to .00001" in roundness.

Due to motor mounted on springs above machine, a One Microinch Surface finish is easily obtained.

The belt runs at a ninety degree angle to wheel slide which enables one to hold size to .00001" and starting and stopping of motor will not affect the sizing.



CRYSTAL LAKE GRINDERS

CRYSTAL LAKE, ILLINOIS

Manufacturers of PRECISION GRINDERS Since 1910

Angier
OF FRAMINGHAM

50th Anniversary
1895-1945

HOW TWO WAR WRAPS ARE STILL GOING "OVER THE TOP"

Two colorful folders illustrate the story. Send for them if you are interested in newer and better ways to protect wartime metal products from corrosion — from all kinds of wet-dirt-moisture damage while in transit or in storage.

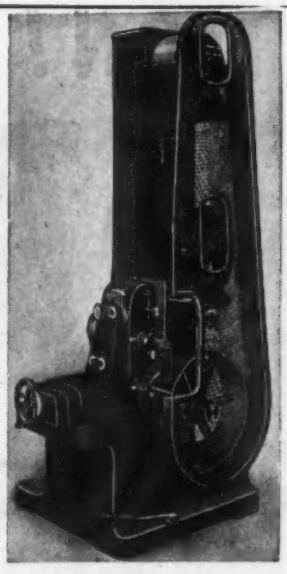
How INDUWRAP, because of its exclusive engineered features, is still winning the battle against corrosion for builders of airplane engines and many highly-finished precision parts. How BROWNSKIN GRIZZLYBEAR (A-19) is still helping to solve for Chrysler of Canada the problem of delivering their engines safely overseas.

These two wraps, and many others of Angier make, have proved in war their quality-right to lasting preference in peace — when peace arrives. They come from the house that has devoted a half-century of protection to the products of our nation and its industries — in peace and war.

★

When writing for samples and literature, please mention by name this magazine.

ANGIER CORPORATION
CORROSION PREVENTIVE AND WATERPROOF PAPERS
FRAMINGHAM, MASSACHUSETTS



Cylindrical or tapered work can be handled automatically on
The "PRODUCTION Type A HIGH SPEED POLISHING MACHINE

An outstanding advantage of this recent "Production" development in high speed, centerless feed polishing machines, is the fact that no centering or chucking are required. Work is merely fed automatically by a power feed attachment.

Where desired, work can be fed to a stop and finishing limited to that portion of the abrasive belt which is to be finished. Regardless of how used, this machine can be operated by unskilled labor with assured results in speed and high quality finish.

A Taper Feed Attachment is available for application to this machine for feeding tapered cylindrical work.

Specifications

Capacity (with power feed attachment) — ¼" to 6" dia.
Speed leather cushion belt — 6300' per min.
Floor Space — 40" x 50". Motor — 10 H.P.

Write for illustrated literature giving full information.

—PRODUCTION MACHINE CO.—
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS
MITTS & MERRILL
913 Tilden St.
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LELAND GIFFORD
PRODUCTION ENGINEERS
at these Branch Offices will help you with your
DRILLING PROBLEMS.

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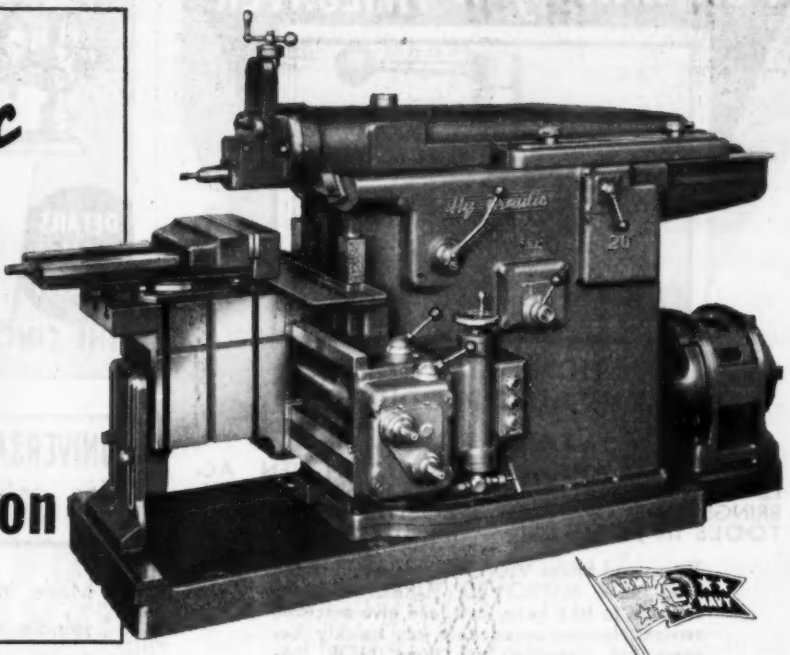
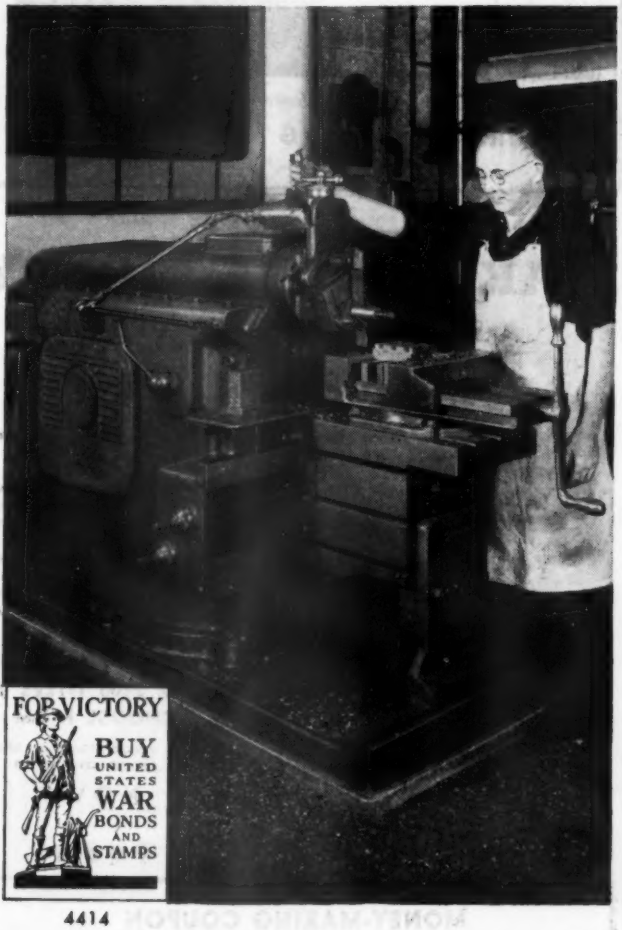
Hy-Draulic

SHAPERS

Save Work

Speed Production



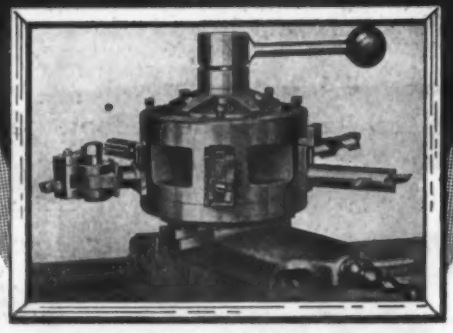


4414

The Rockford Hy-Draulic Shaper shown at left, is one of a pair that had been operating continuously for more than three years when this picture was taken. Tool and die work, production and maintenance jobs in great variety come to these shapers steadily. In all of this work Hy-Draulic Shaper features and advantages lighten the load on operators while speeding production in many ways. For example, length of ram-stroke, and its position relative to the work-piece, are established quickly by simple manual adjustment of two dogs—no tools are required, no cranking, there's hardly a pause in machine operation. Power rapid traverses in all directions speed set-up and production. Hydraulic ram-drive and hydraulic feeds, adjustable to any rate whatever in specified ranges, make it easy for operators to get the *exact* combination of cutting speed and feed that is best for each job. Many other features in Hy-Draulic Shapers promote easy profitable operation and long life. Investigate these machines. Write today, for the name of our nearest representative, and ask for Bulletin 1125.

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

PORTRAIT *of* A TIMESAVER



5 STATION LATHE TURRETS ARE VITAL TO PRODUCTION

SAVE TIME

1 — JUST A TURN AND A LIFT OF THE HANDLE BRINGS ONE OF FIVE TOOLS IN POSITION

2 — THIS, WITH TEN ACCURATE INDEXED TOOL POSITIONS ALLOWS MINUTE ADJUSTMENTS

Time saved brings VICTORY that much nearer. Our NEW IMPROVED TURRET HEADS are built to take heavy cuts, and give precision service. Inexperienced help can quickly become fast operators with these NEW IMPROVED TURRET HEADS.

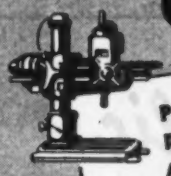
MADE UP IN FOUR INDIVIDUAL SIZES

For Lathes From 9" to 30" Swing — Write Today for Details

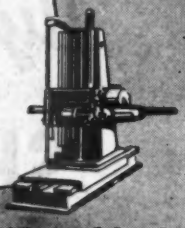
AUTOMATIC MACHINE & TOOL CO. — ENGINEERED PRODUCTS — AUBURNDALE, MASSACHUSETTS

332 CHARLES STREET, AUBURNDALE, MASS.

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



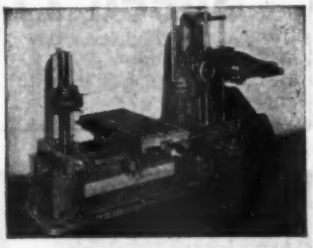
DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

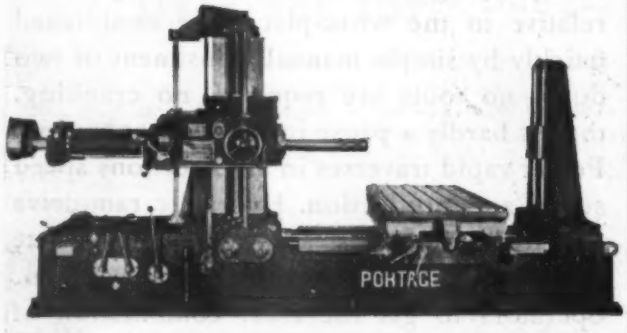
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

PORTAGE



NO. 4 HORIZONTAL BORING DRILLING & MILLING MACHINE

• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

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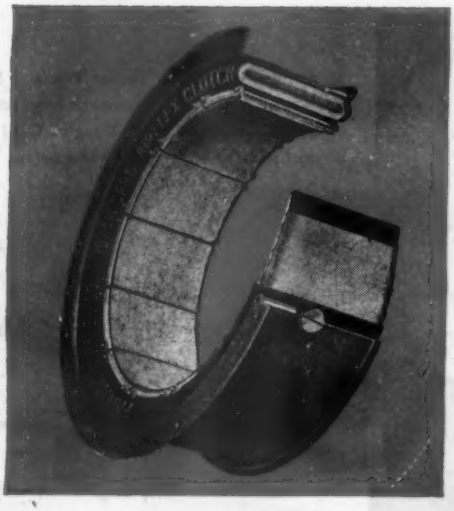


WAR RECORD PROVES PERFORMANCE...FOR HEAVY-DUTY DRIVES

Thousands of Diesel-driven craft of many types have been equipped with Fawick Airflex Clutches. Without a single exception these ships are more effective, through greater maneuverability and more dependable performance under battle conditions.

The proved advantages and economies of the Fawick Airflex Clutch are now available for all industrial equipment that calls for heavy service clutches, brakes, slip clutches and power take-offs.

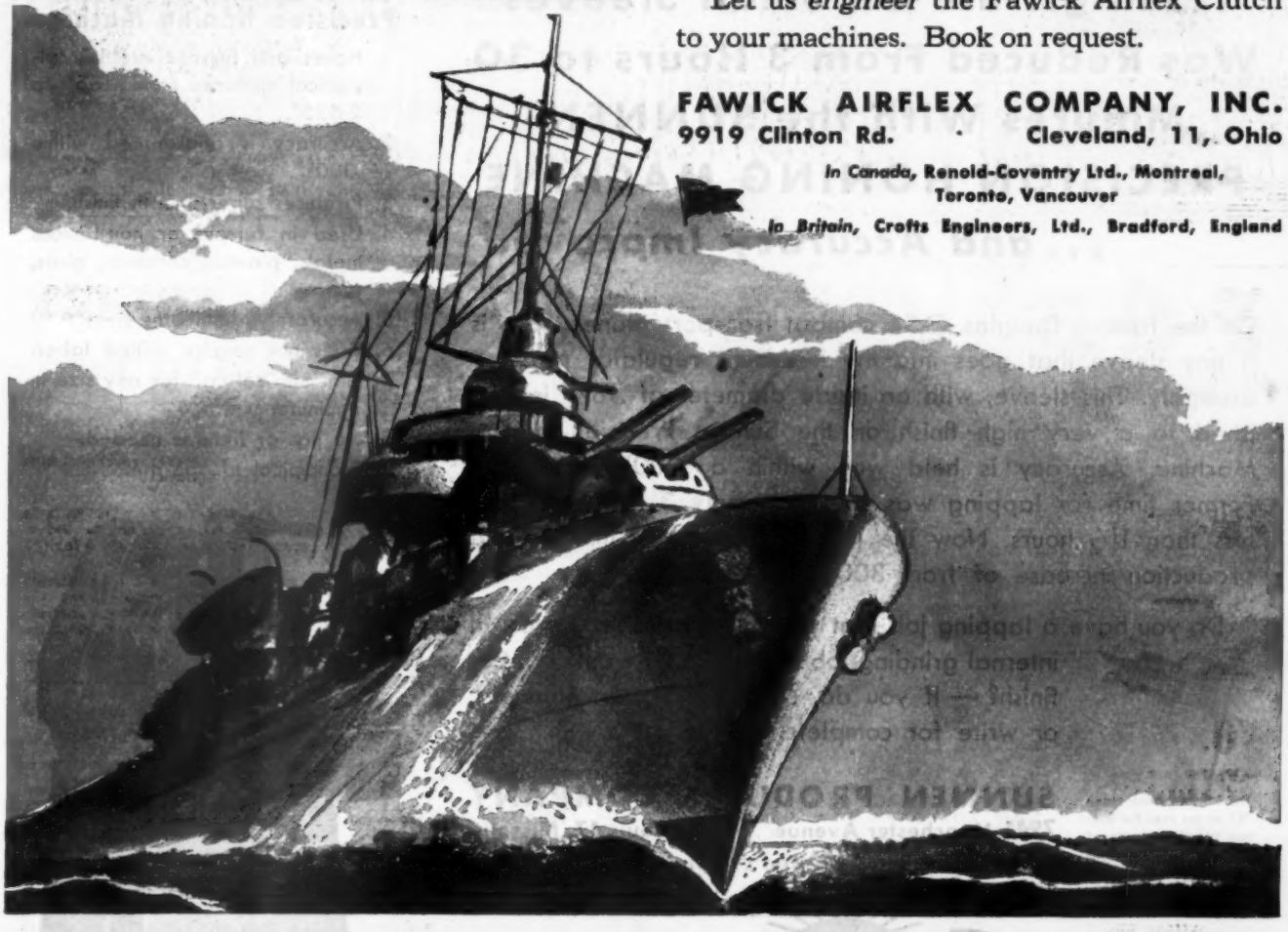
Airflex is the only clutch that controls torque by air pressure—without springs, levers or toggles. Direct or remote control. No adjustments to make—no lubrication required. Misalignment presents no problem. Maintenance costs unusually low.

Let us *engineer* the Fawick Airflex Clutch to your machines. Book on request.

FAWICK AIRFLEX COMPANY, INC.
9919 Clinton Rd. · Cleveland, 11, Ohio

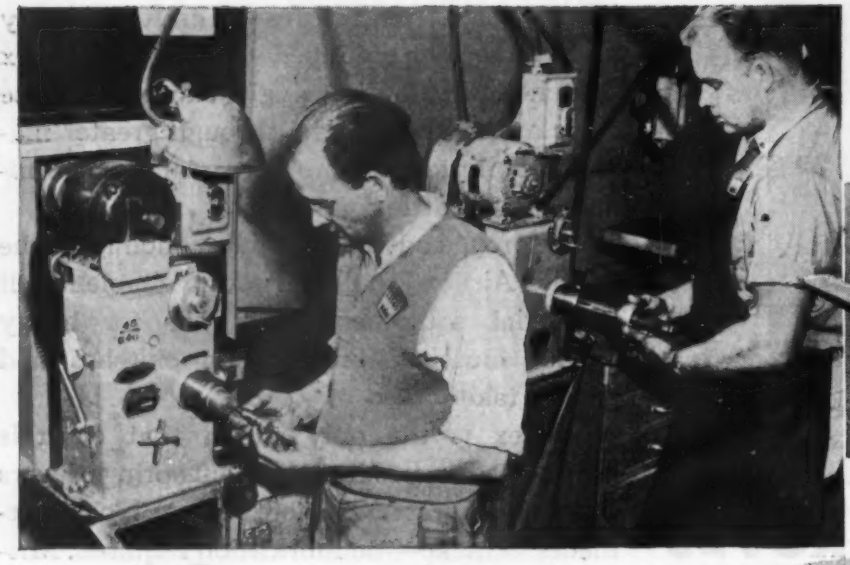
In Canada, **Renold-Coventry Ltd., Montreal, Toronto, Vancouver**

In Britain, **Crofts Engineers, Ltd., Bradford, England**



FAWICK *Airflex* CLUTCH

POWER CONTROLLED BY AIR



At left—two of the Sunnen Precision Honing Machines used in the precision manufacturing of parts for the famous Douglas C-54 transport planes like the one shown below.

At Douglas Aircraft...

Honing Time On Small Sleeves Was Reduced From 3 Hours to 30 Minutes With the SUNNEN PRECISION HONING MACHINE ...and Accuracy Improved

On the famous Douglas C-54 combat transport plane, there is a tiny sleeve that goes into the hydraulic regulator pressure assembly. This sleeve, with an inside diameter of .187" is polished to a very high finish on the Sunnen Precision Honing Machine. Accuracy is held well within a .0001" tolerance. Former time for lapping was approximately 3 hours — never less than 1½ hours. Now the job is done in 30 minutes — a production increase of from 300 to 600%!

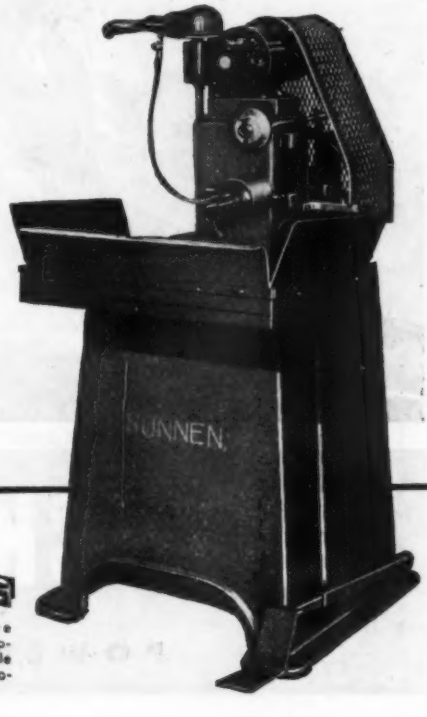
Do you have a lapping job that you'd like to speed up or an internal grinding job on which you want a better finish? — If you do, call in a Sunnen engineer, or write for complete details.

The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

SUNNEN PRODUCTS COMPANY
7941 Manchester Avenue • St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

Sunnen Precision Honing Machine

1. Hones and finishes internal cylindrical surfaces from .185" to 2.625".
2. Accuracy is guaranteed within .0001".
3. Produces super-smooth finish.
4. Used in ferrous or non-ferrous metals, plastics, ceramics, glass, etc.
5. Accurately duplicates sizes.
6. Does not require skilled labor.
7. Can be "set up" for any size in 1 minute.
8. No jigs or fixtures needed.
9. Economical to operate.



SUNNEN

Bearing. A very small part. 2 micro-inch finish necessary.

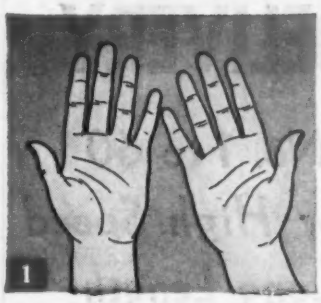
Cones for Wheel Balancing Machine "Accurately align bones, two interrupted surfaces."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

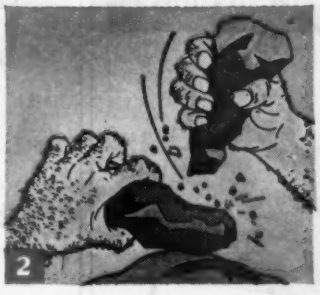
Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro-inch finish.

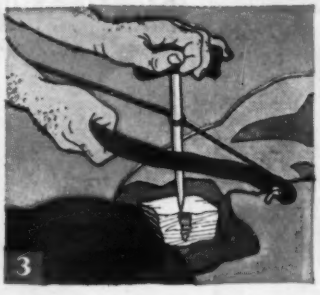
It started with the other hand



Right or left-handed, your *other* hand is a type of jig.

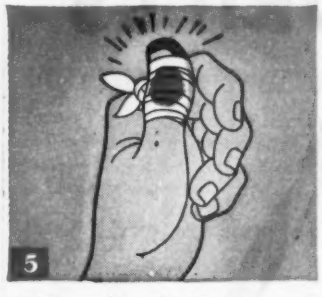


A jig is something to hold work while you're working on it.

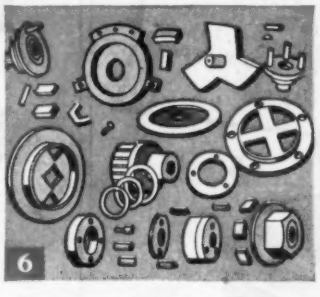


Notches in stones or logs left both hands free.

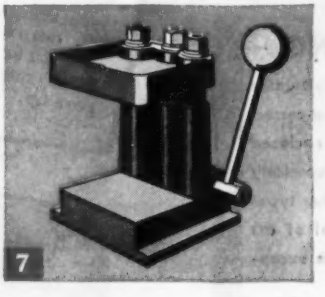
Two heavy stones once served as a sort of vise or jig.



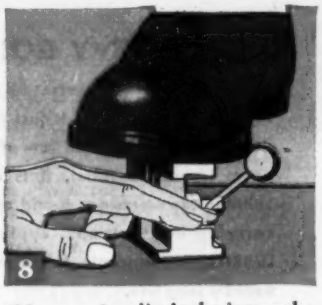
Modern adjustable jigs have two faults. Some slip, hurt people.



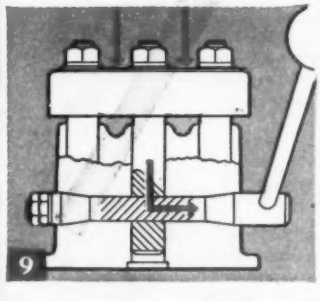
Locking mechanisms of others wear out fast or fail.



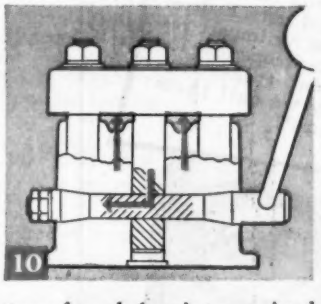
These problems were solved by Woodworth's CONE-LOK JIG.



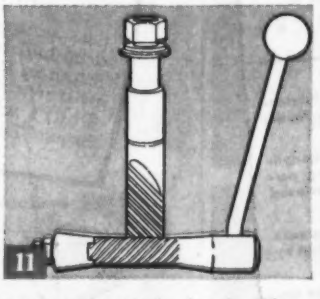
This amazing jig locks instantly. Can't slip. Protects workers.



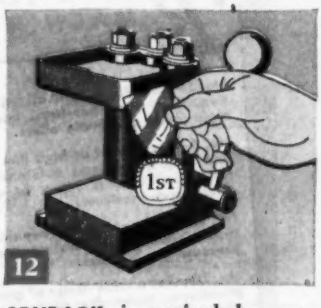
Force on top travels thru 45° gear to right. Left cone locks.



Force from below is transmitted to left . . . locks cone at right.



CONE-LOK JIG is simple. Three moving parts do the job.



CONE-LOK is praised by production men everywhere.

What Woodworth products mean to industry

THE contribution to mass production efficiency made by the CONE-LOK JIG is typical of all Woodworth products.

There is a reason for this.

Every Woodworth product must conform to the basic policy of this company . . . *to make only products which will benefit industry through increased production and reduced costs.*

This means that the great demand for Woodworth Tools and Gages will be continuing, especially in view of the coming battle for postwar markets.

And it means that Woodworth engineers have been charged with the responsibility of searching constantly for new ways to speed up and lower the cost of production, in connection with Woodworth products of the future.

The constant growth and expansion of the N. A. Woodworth Company is due to strict adherence to these objectives.

ACCURACY YOU W CAN TRUST

WOODWORTH

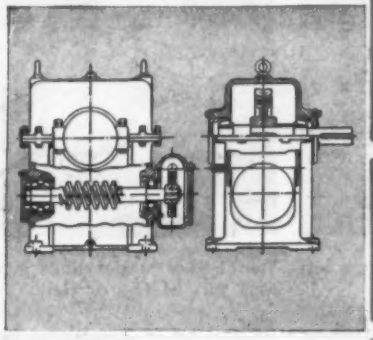
N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD, DETROIT 20, MICHIGAN

PRECISION GAGES

PRECISION MACHINED PARTS

PRECISION TOOLS

LUBRIPLATE No. 8



FOR HEAVY GOING

LUBRIPLATE No. 8 possesses an extremely high film strength and is just the correct density for the general run of enclosed gears (speed reducers). It is especially suitable for worm gears and other types carrying heavy loads. Typical of all LUBRIPLATE lubricants, No. 8 has exceptionally long life.

Rx FOR YOUR MACHINERY

No. 3—Ideal for general oil type lubrication. Ring oiled bearings, wick feeds, sight feeds and bottle oilers.

No. 8—Because of its high film strength and long life reflects outstanding performance in most types of enclosed gears (speed reducers).

No. 107—One of the most popular grease type products for general application by pressure gun or cups.

No. 70—For a wide range of grease applications, especially at temperatures above 200 degrees F.

No. 130-AA—Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

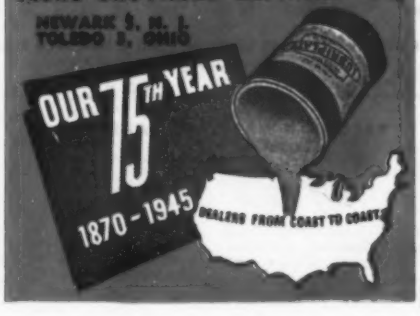
BALL BEARING—This is the LUBRIPLATE lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 3000 RPM and temperatures up to 300 degrees F.

Write for a booklet, "The LUBRIPLATE Film", written especially for your industry.

LUBRIPLATE

FISKE BROTHERS REFINING CO.

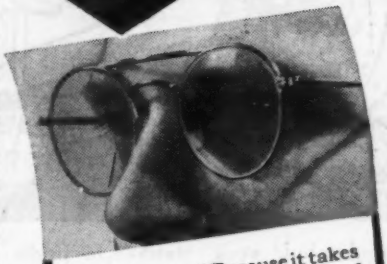
NEWARK 5, N. J.
TOLEDO 5, OHIO



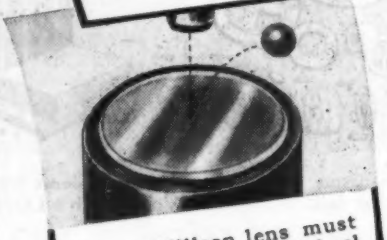
Willson Safety Spectacles

20 SIZES

So You Can Fit Anybody!



Why 20 sizes? Because it takes that many to fit every type of face accurately. And, above all, *comfortably*. Result—workers keep them on. Injury rates come down. Efficiency goes up.



Every Willson lens must pass most rigid tests. Federal drop-ball test for impact resistance. Polariscope test for uniform heat treatment. That's why we call them SUPER-TOUGH*!

Protection's not complete unless sides are considered, too. Style AS, with sideshields, provides all-over eye safety. For frontal protection only, use Style A, without sideshields.

For help on your eye-protection problems, see your Willson Distributor or write to Dept. AM-11.

*T. M. Reg. U. S. Pat. Off.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

WILLSON

DOUBLE

PRODUCTS INCORPORATED

READING, PA., U. S. A. — Established 1870

Also makers of world famous Willsonite sunglasses

IMMEDIATE DELIVERY

No. 1 to 60 New High Speed Long Length DRILLS

No. by Gage	Length	Our Price Net Each
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
31 to 40	5¼	.75
41 to 50	4½	.75
51 to 60	4¼	.75

If you buy 60 drills or more — 20% discount

VICTOR MACHINERY EXCHANGE INC.

251 CENTER STREET
NEW YORK N. Y.

"LOGAN" Manufactures Complete Equipment for Air & Hydraulic Systems That Save • *Time* • *Effort* • *Motion*

AIR AND HYDRAULIC OPERATED CHUCKS

Logan power-operated chucks permit fast, positive, accurate chucking by operating a convenient control valve. Production may be profitably increased as chucking time is cut to *seconds*. Idle machine time is reduced . . . operator fatigue minimized. High accuracy and finish result from the rigid set-up. The constant, equalized jaw pressure with follow-up eliminates spoilage. (*Write for Catalog 70-1.*)

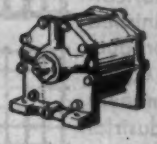
ROTATING CYLINDERS

These Logan double-acting air and hydraulic cylinders are especially designed for mounting on rotating machine spindles.

NON-ROTATING CYLINDERS

Logan non-rotating air and hydraulic cylinders provide fast-acting, controlled power for pushing, pulling, lifting, pressing, clamping, holding and many other applications. Savings in operator time and fatigue permit increased production. The constant power with follow-up assures positive, uniform actuation. Product design may be simplified.

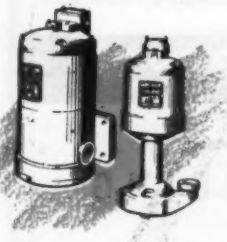
AIR CYLINDERS



Logan double-acting air cylinders are designed and built for quick response and maximum power without leakage. Permanent seal. Cushioned if desired. For pressures to 150 p.s.i. (*Write for Catalog S-25.*)

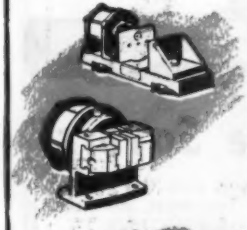
NEW *Rotocast* HYDRAULIC CYLINDERS

Clean bore in *centrifugal-cast* barrel and "O" ring seal assure full, uniform power flow without leakage. No tie rods—no gaskets. For pressures to 1500 p.s.i. (*Write for Catalog 84.*)



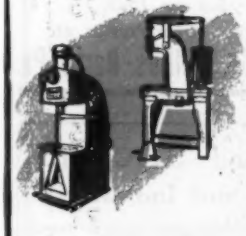
NEW *Sure-Flow* COOLANT PUMPS

This new, improved centrifugal pump safely handles liquids containing some abrasives. Self-priming without submerging types. Splash-proof motor — integral motor drive. 5 standard mounting types. (*Write for Catalog 62.*)



AIR-OPERATED VISES AND FIXTURES

Quick-acting, precise Logan air vises help increase output, improve accuracy and reduce costs. Positive pressure with follow-up prevents spoilage. Hold any shape work. (*Write for Catalog S-25.*) **Special fixtures to specifications.**

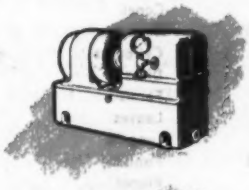


HYDRAULIC AND AIR PRESSES

For bending, forcing, forming, broaching, assembling and other pressing operations. Standard air-operated arbor presses; standard high and low platen hydraulic presses. (*Write for Catalog 51*). **Special presses to specifications.**

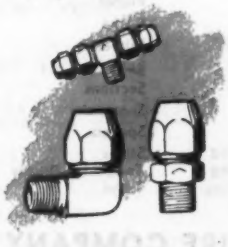
HYDRAULIC AND AIR VALVES

Logan air and hydraulic valves are available in a complete range of types for hand, foot, electric solenoid, cam, pilot and latch operated control. (*Write for air valve Bulletin 371; hydraulic valve Catalog 80, Section 3.*) **Complete line of air accessories also available.**



HYDRAULIC POWER UNITS

Self-contained Logan hydraulic power units supply positive, uniform, controlled pressure for hydraulic circuits. Pump, relief valve and piping are enclosed for protection. All parts readily accessible. (*Write for Bulletin 581.*)



Collet-Grip STEEL TUBE FITTINGS

For permanently leak-proof, vibration-proof tube connections. Manufactured in 2 designs—compression nut with collet, and single nut and sleeve. No digging into tube. Both types built to grip tube and relieve vibration at flare. Can be re-used. (*Write for Catalog 44.*)

★ ENGINEERING ASSISTANCE for Designing Air and Hydraulic Systems

Without obligation, Logan engineers will gladly co-operate in designing complete air and hydraulic systems to solve your individual problems. Layouts and circuit diagrams furnished. They will also assist you in the selection of all necessary equipment, including cylinders, valves, accessories, fittings, power units, etc., to your specific needs. Send complete details and specifications or call in Logan engineers.

ARMY E NAVY

SPECIAL MACHINES

Logan

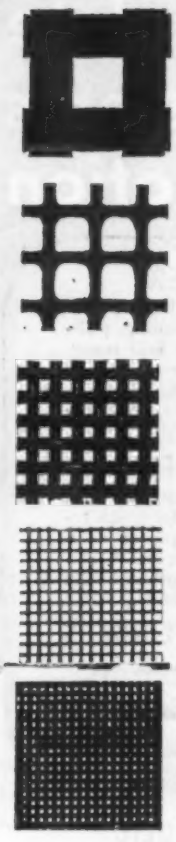
SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC.

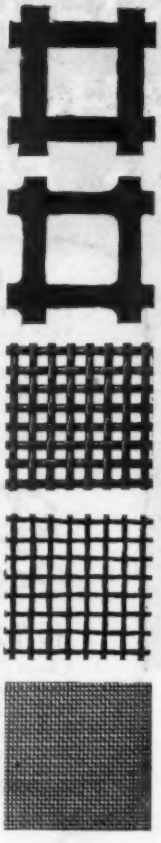
918 CENTER AVE. LOGANSPORT INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS



LUDLOW-SAYLOR

PRECISION WIRE CLOTHS AND SCREENS FOR ALL INDUSTRIAL PURPOSES



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We invite your inquiries for wire cloths of all commercial metals or alloys or weaves, in continuous lengths or cut to size, or processed to meet your individual requirements.

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Any special alloys available in rod or wire form	Stranded	Galvanizing	Ribbons
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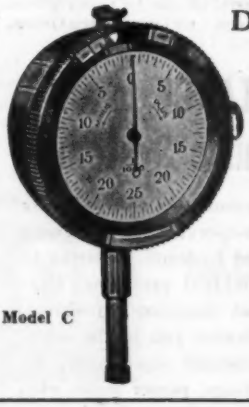

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Capacity, any single dimension between 1/8" and 1 1/2"
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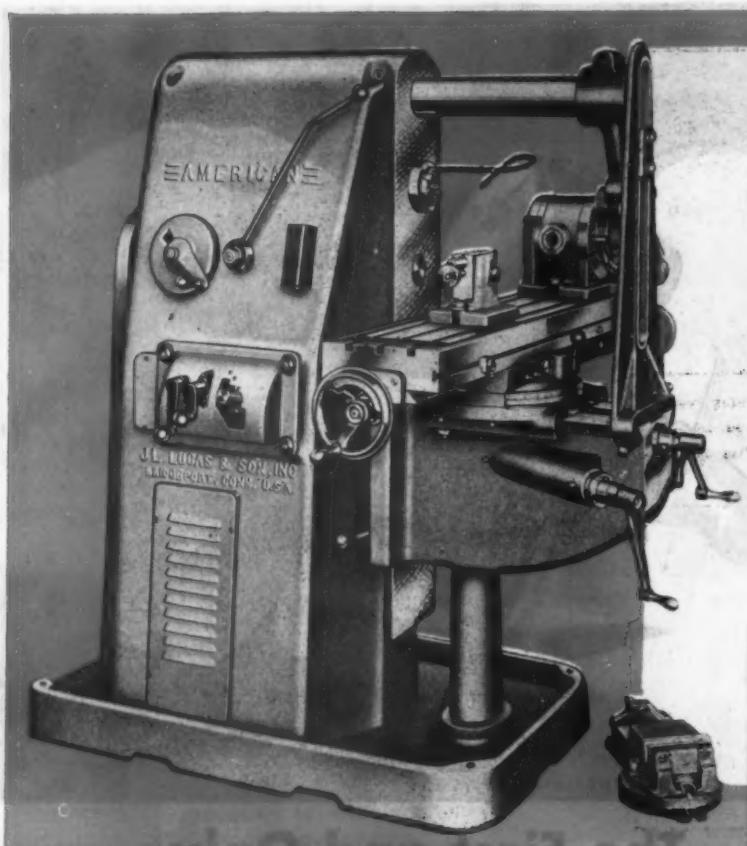

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RANGE—Longitudinal Power Feed—25"
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Vertical Hand Feed—17"
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SPINDLE—Standardized Flanged Nose—No. 40 Taper
Hole through spindle—21/32" dia.
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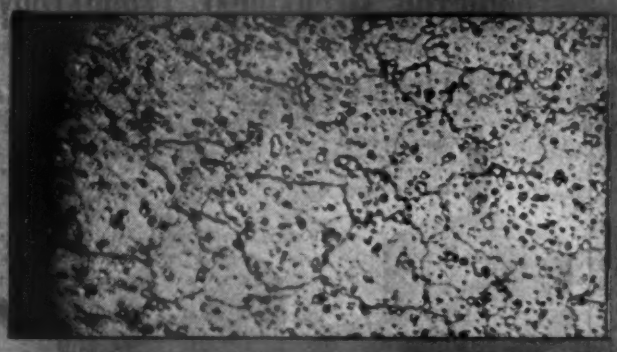

Figure 1—750X—Edge structure of Tungsten-Molybdenum type high speed steel treated in Park No. 175 High Heat Salt for seven minutes at 2200° F. Note absence of decarburization in the "as quenched" structure.

Figure 2—500X—(Reduced in printing.)—Edge structure of a high speed steel tool after several hours immersion in a Park No. 175 High Heat salt bath. Note large grain size, carbide distribution, and absence of decarburization.

Figure 3—750X—Edge structure of a hardened and drawn high speed steel tool after treatment in Park No. 90 Casing Salt. Note the dark etching nitride "case" which is responsible for the improved cutting ability and longer life shown by tools receiving this treatment.

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NO OXIDATION, decarburization or pitting occur when high speed tools are heat treated in Park salt baths.

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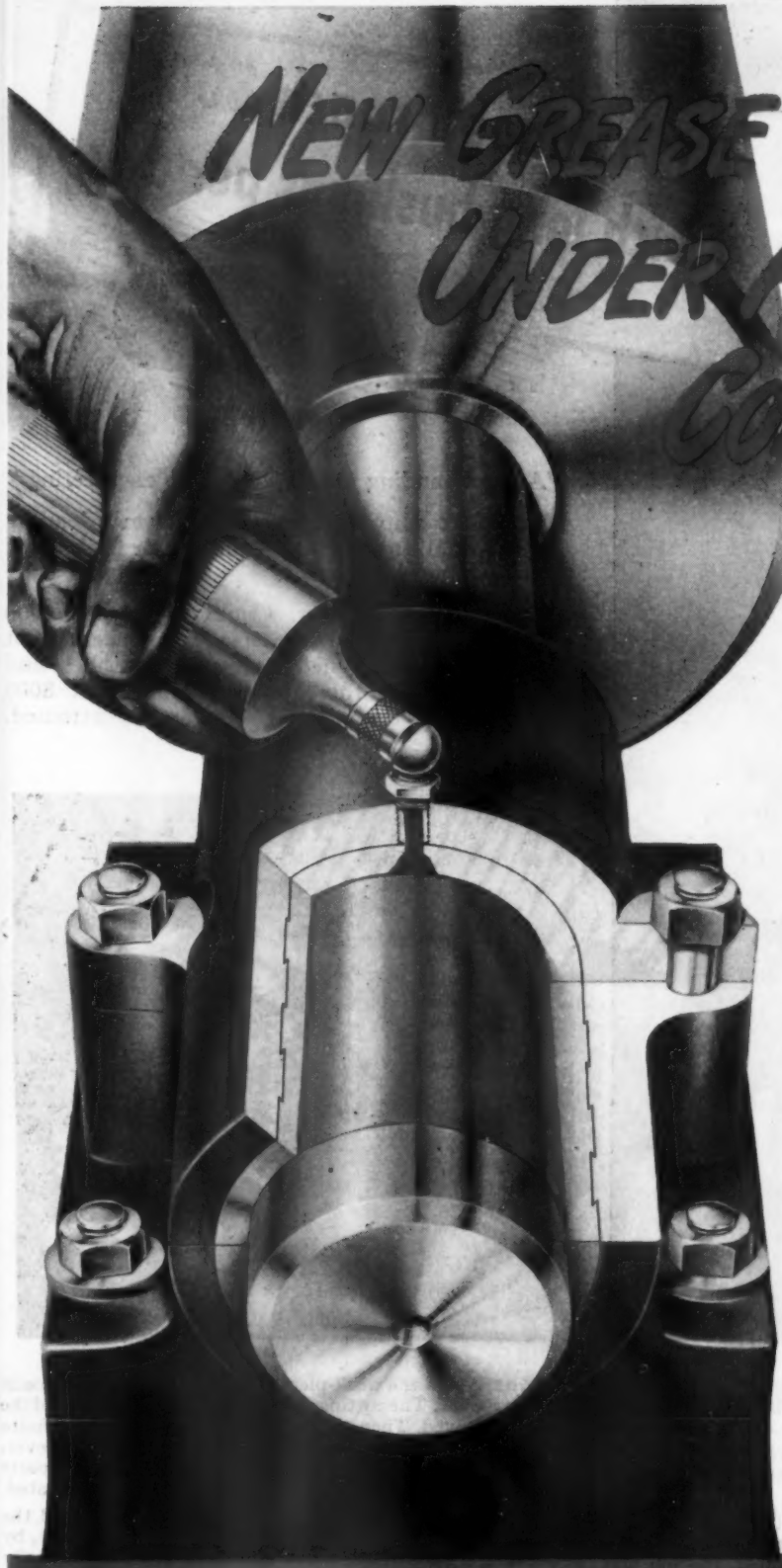

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4 machines broach 8000 7 inch long bushings per day

"An outstanding example of tool engineering."

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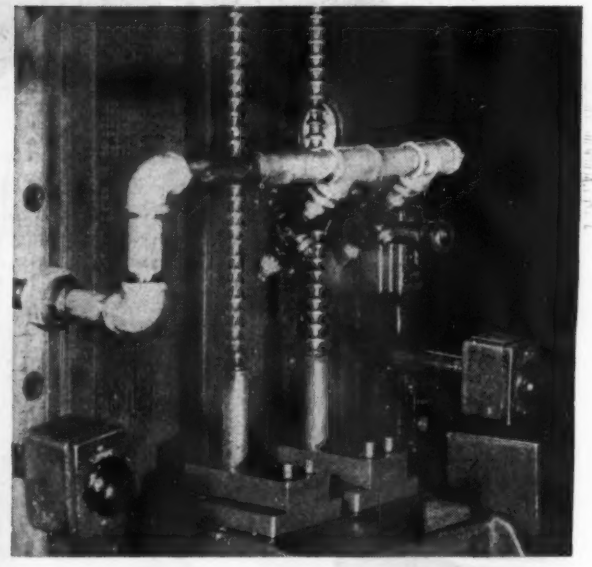

These 7 inch long tank track pin bushings (material was heat treated seamless steel tubing at 38 Rockwell C) were to be internally broached with two inverted keys running the full length of the bushing.

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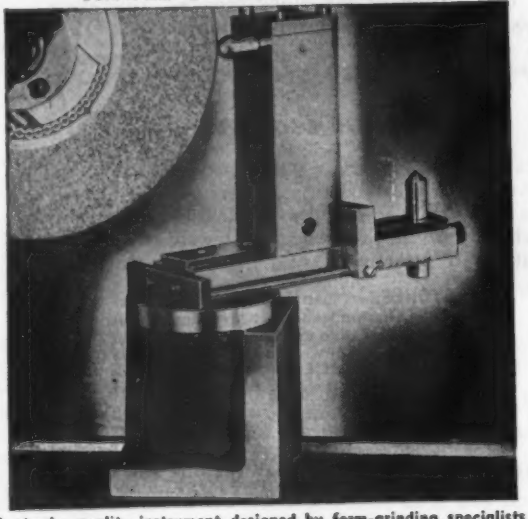

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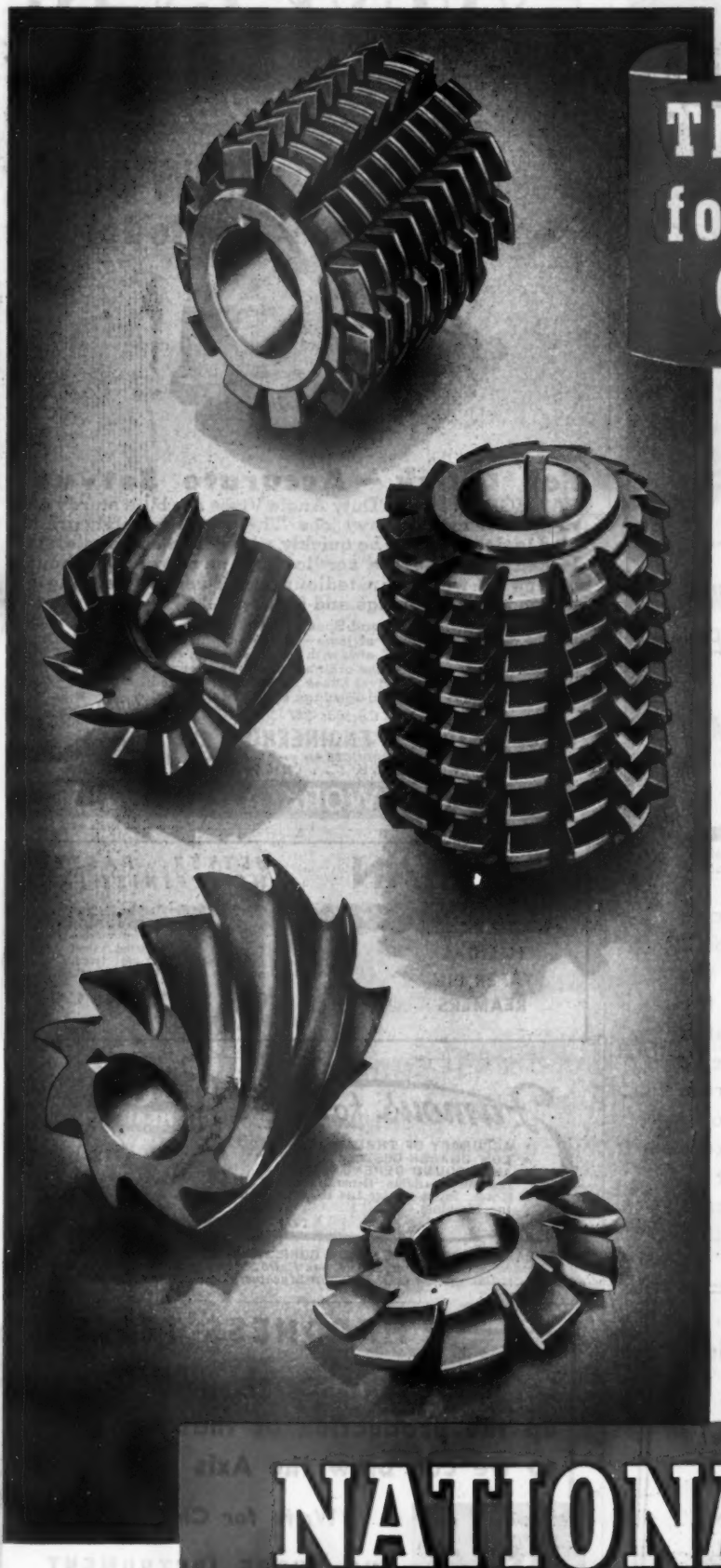

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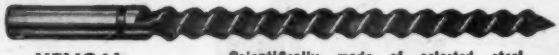

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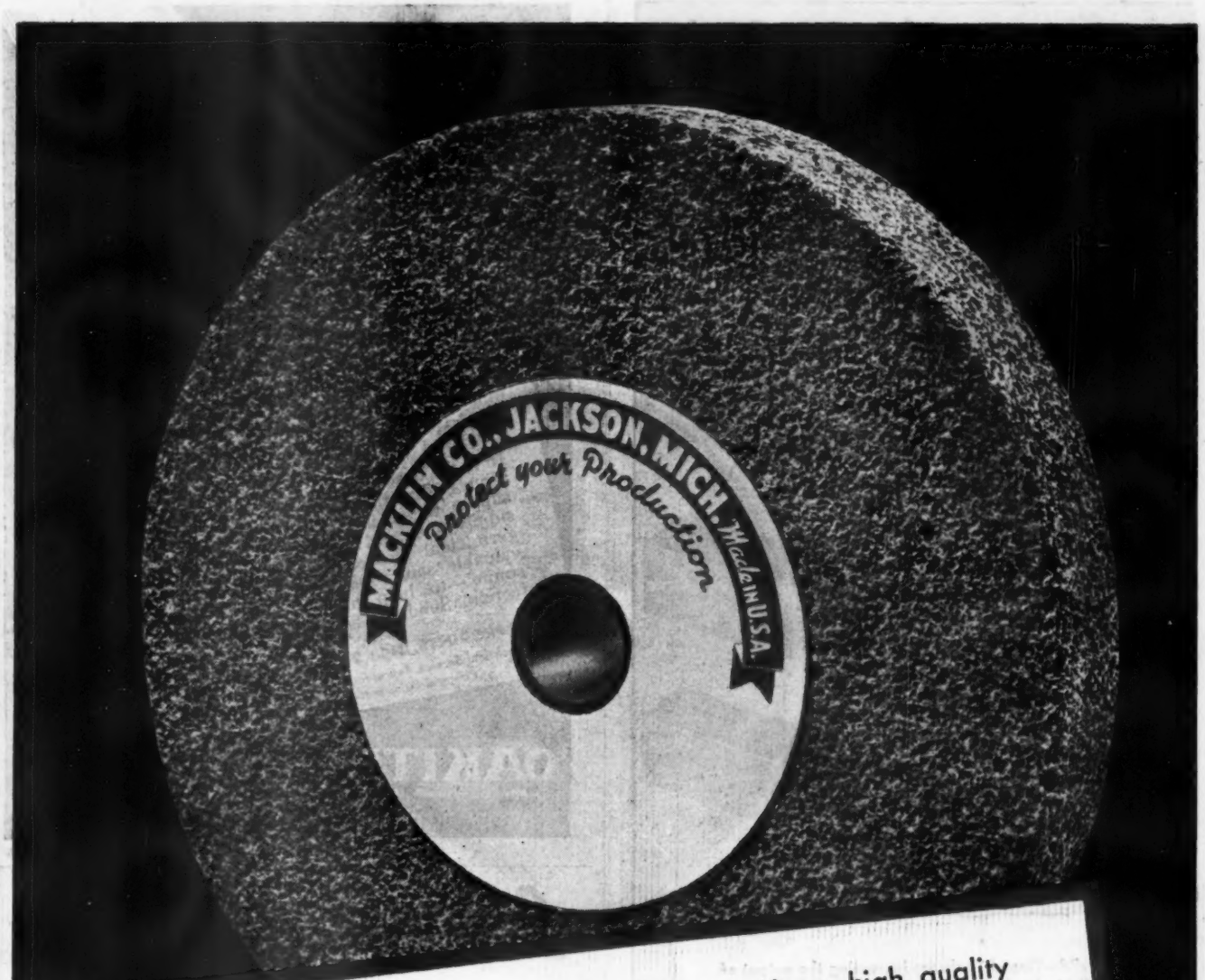

"PROTECT YOUR PRODUCTION" with uniform, high quality Macklin Grinding Wheels. There is a Macklin Wheel for every type of grinding job.

Ask for the services of a Macklin Field Engineer.

MACKLIN GRINDING WHEELS

MACKLIN COMPANY — *Manufacturers of* GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

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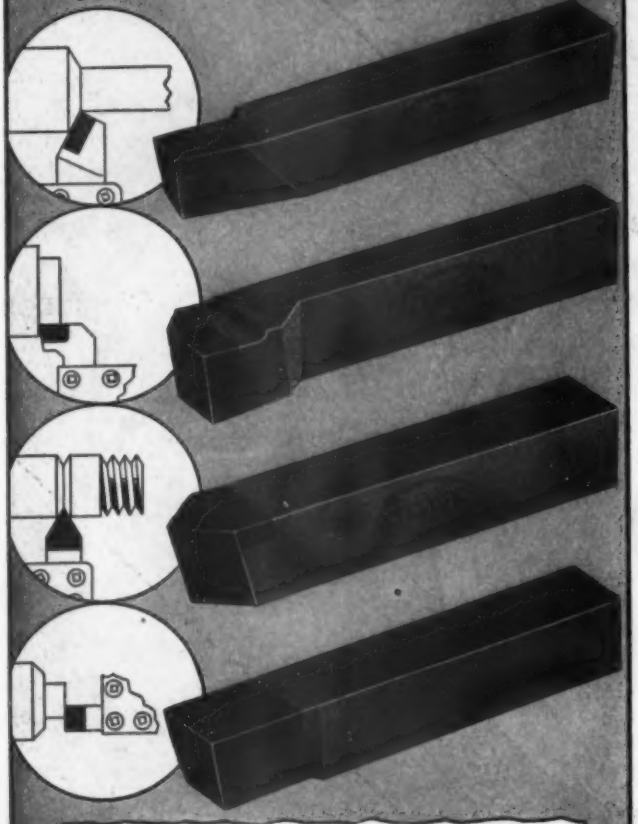
TALIDE TOOLS for Higher Speed Production!



Talide-Tipped Tools are increasing the output of all kinds of machined parts because they cut faster, last longer and produce a better finish. The extra hardness, density and toughness of Talide Tips make their use universal for both heavy hogging and fine finishing work.

Reduce your cost of machining hard castings, steel forgings and other precision parts by using Talide-Tipped Tools to produce more pieces per grind—in less machine time. Available in both Tungsten Carbide and Tungsten-Titanium Carbide compositions, Talide-Tipped Tools give longer run, higher speed performances on all types of boring, facing and turning operations.

Send for Catalog 44-T listing Standard Tools and Tips.

TIPPED WITH TUNGSTEN CARBIDE

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TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

Is THIS a Production Problem?

PREVENTING RANCIDITY IN COOLANT SOLUTIONS?

Do your coolant solutions go rancid, so that frequent changing becomes necessary? Then you will want the helpful precautionary methods for combating bacteria growth in oil-water emulsions—outlined in a specially prepared, four-page Service Report. In it are described Oakite materials and techniques for thoroughly cleaning out main supply tanks, individual tanks on machines, supply lines and pumps. It gives subsequent germicidal procedures. Also included are valuable sanitation tips—for plant and personnel—to help minimize dermatitis infection. Send for a FREE copy.

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Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada

OAKITE MATERIALS METHODS SERVICE — Buy Bonds for Victory — **CLEANING** FOR EVERY CLEANING REQUIREMENT

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

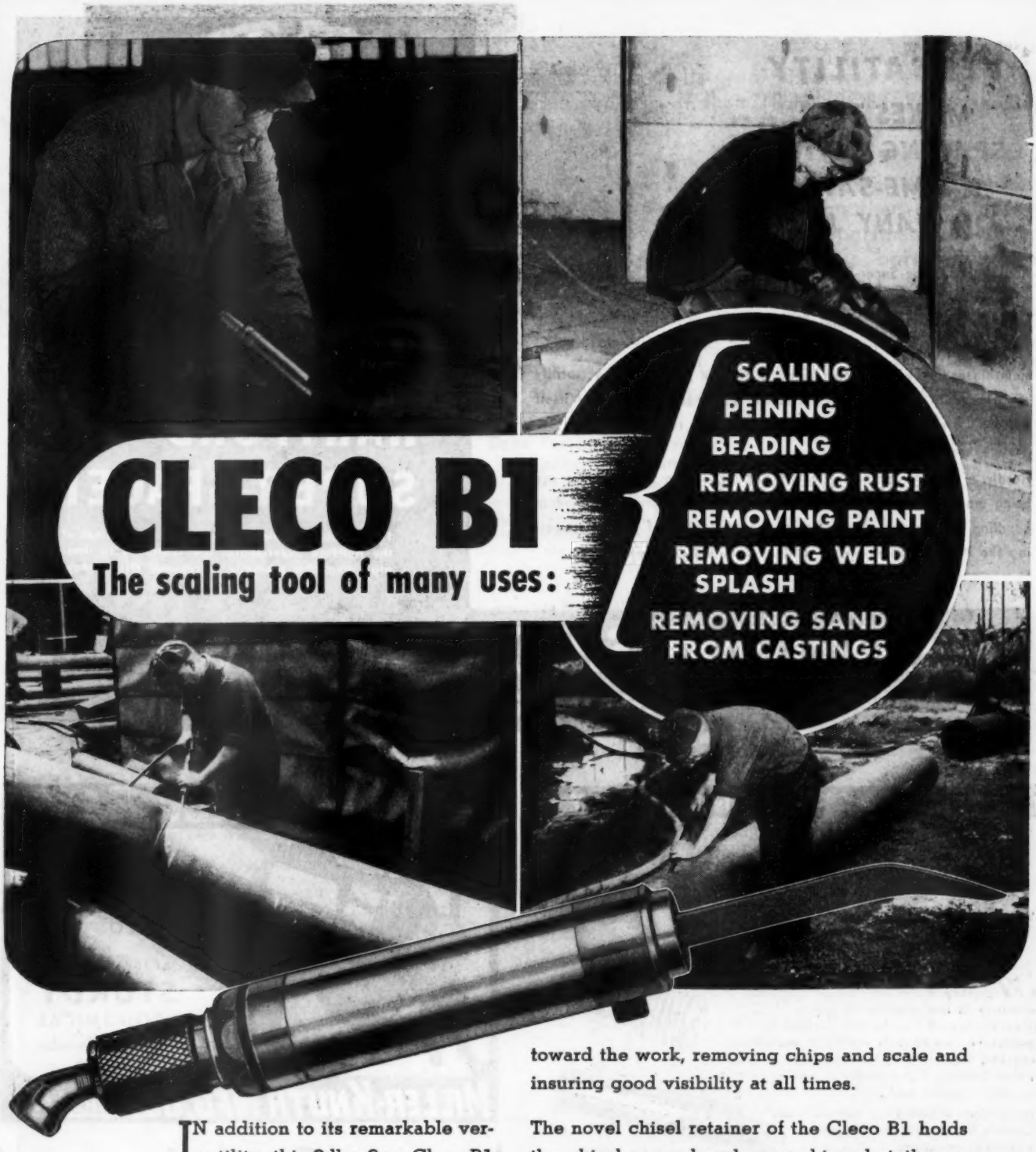
• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 15

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO



CLECO B1

The scaling tool of many uses:

- SCALING
- PEINING
- BEADING
- REMOVING RUST
- REMOVING PAINT
- REMOVING WELD SPLASH
- REMOVING SAND FROM CASTINGS

IN addition to its remarkable versatility, this 3 lbs. 6 oz. Cleco B1 Scaler has many unusual features of design. The *graduated control valve* is at the rear end, the natural pressure of the operator's hand automatically admits just the right amount of air. Thus the tool always runs without excess consumption of air. Also, the exhaust is directed toward the work, removing chips and scale and insuring good visibility at all times.

The novel chisel retainer of the Cleco B1 holds the chisel securely when working, but the retainer releases by only light pressure of the thumb. The "nose" or chuck is broached square, preventing the chisel from turning and insuring longer life. One ½" chisel (to your specifications) or one chisel blank is included with the tool. *Write for complete data and specifications.*

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BUY MORE WAR BONDS!

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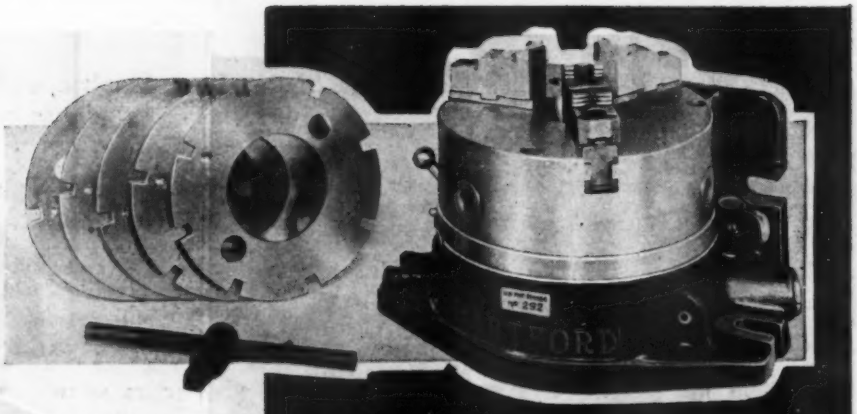
VERSATILITY MAKES THIS SPACING DEVICE A TIME-SAVER ON MANY JOBS



Ability to use the Super-Spacer in either a vertical or horizontal position in conjunction with milling, drilling, grinding, planing, slotting or jig boring, and to maintain accuracy on *all* operations, is definite proof of the versatility of this modern spacing device. It means also that it will pay for itself over and over again, whether used in the tool room or on the production line.

Hardly a day passes but new applications of the Super-Spacer are being made. And each application results in an improved method of handling a job, a fact that indicates the advisability of your investigating the Hartford Super-Spacer and its possibilities in your shop.

The HARTFORD SUPER-SPACER

Full details, including many typical applications of the Hartford Super-Spacer are contained in literature available promptly on request. Write today.

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Use JKS DIAMOND TOOLS *for* ACCURACY

Accuracy in the selection of diamonds, accuracy in the selection of metals, accuracy in tool manufacture combine to produce a line of tools worthy of your most exacting requirements, for every type of wheel dressing. For accuracy in results, use JKS diamond tools.

For Straight Dressing use Stakool Tools. Cooling fins protect the diamonds against overheating.

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For Varied Finishes use Smitite Cluster and diamond impregnated tools with sintered carbide matrices.

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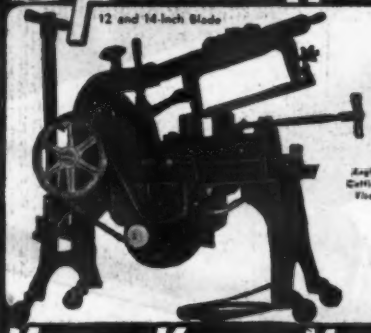
POWER HACK SAW ★

12 and 14-Inch Blade



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HAND CUT • MILLED CUT

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There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. Send for Catalog DR. illustrating the complete line in full size, speed charts, etc.

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• Northern Electric, at its great Shearer Street plant, Montreal, make good use of their TRANSPORTERS in keeping products pouring out.

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The man hours saved, the decreased handling of processed materials and the speeding up of the production flow between departments, has been successfully engineered with the help of compact, dependable TRANSPORTERS.

Send for bulletins featuring other installations

We have a number of bulletins available, each featuring the TRANSPORTER at work in a different industry and pointing out the savings made.

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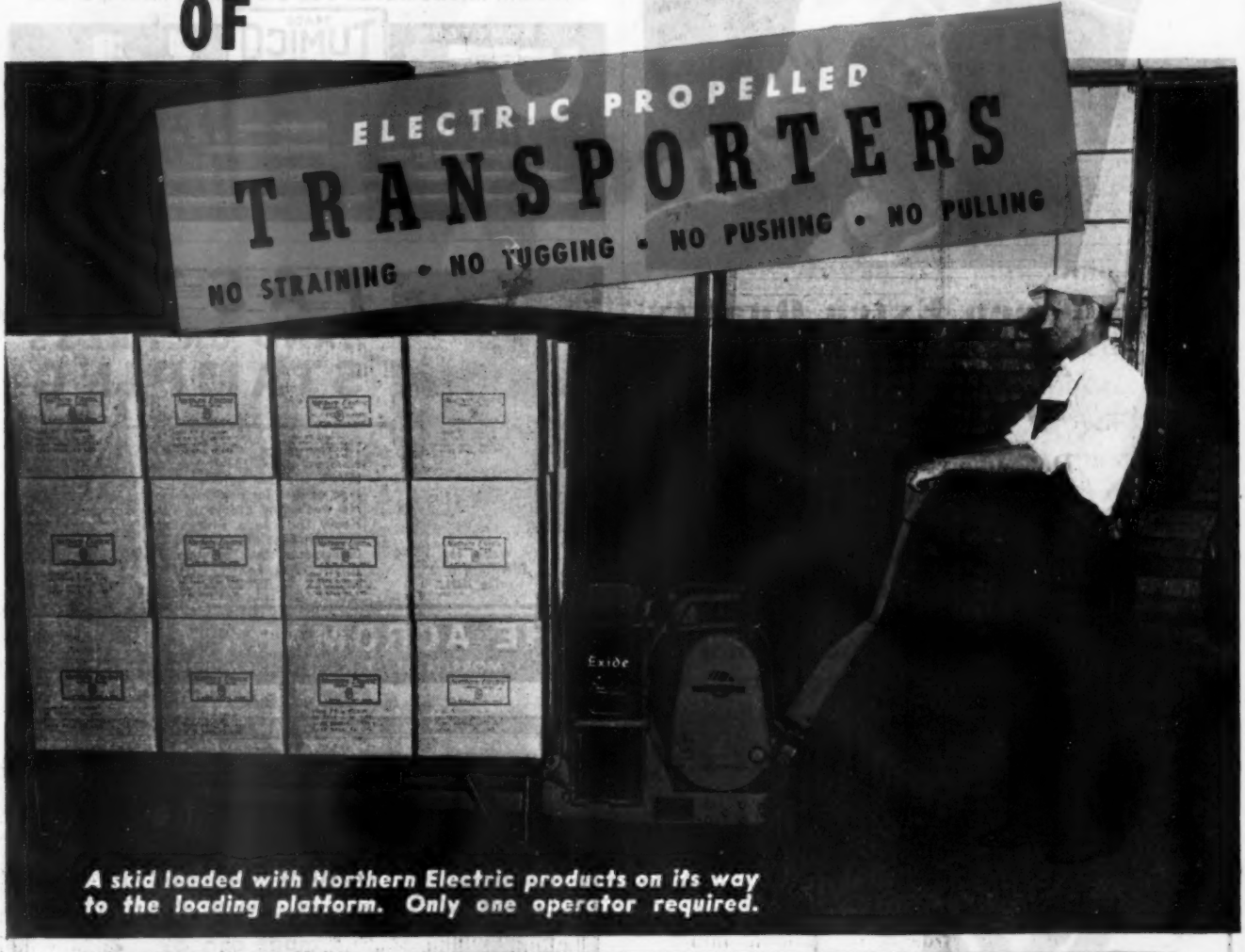

A skid loaded with Northern Electric products on its way to the loading platform. Only one operator required.

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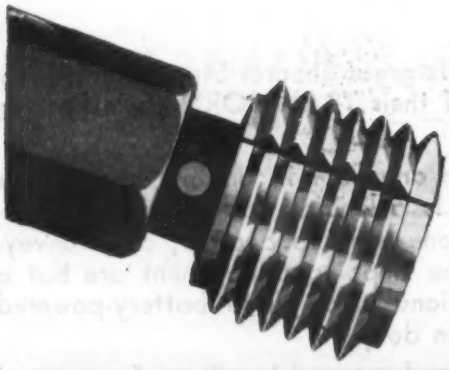

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A Big League Star has it
The NEW V-nide has it

Depend on the new V-nide gage for longer wear and accurate checking. Consider! On aluminum, V-nides gaged 4532 holes per .0001 of wear, against 338 holes per .0001 for tool steel gages. With only an approximate 17% increase in price for V-nides, your gaging costs should hit a new low.

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TU-MI-CO TUBULAR FRAME of special homogeneous grain structure steel is 25 to 50% lighter than solid frame—yet highly shock resistant. Lessens fatigue. Hermetically sealed, low thermal conductivity, less expansion. Triple plated—copper, nickel and chrome, buffed and polished—an attractive, high quality precision tool.

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Fast, Economical

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For ripping or roughing dies, grit size No. 240-N is recommended, and No. 320-N or No. 400-N for semi-finishing operations. These NORBIDE compounds are made in all standard grit sizes including 600-N and 800-N for extremely fine finishing. Comes ready mixed—simply apply compound and start lapping.

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·RIGHT... down the line in types and sizes

You'll find all types and sizes of Bay State Grinding Wheels for all types of work ... RIGHT, down the line. Centerless grinding, cylindrical grinding, disc grinding, internal grinding, snagging, cutting-off, etc. . . . Sizes, shapes, bonds, grades, grains, and structures to meet specific requirements right.

And once you have determined on a type and size that suit your job right, you can expect to get the very same qualities on repeat orders. "Top performance, consistently duplicated" results from extremely close control over materials and manufacturing processes plus such Bay State features as

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"Controlled Porosity" — a precise method of spacing cutting units which not only makes closer selection possible but also exact duplication.

Such a combination of features are your assurance of getting grinding wheels that are RIGHT — down the line. So whatever your needs for grinding wheels, look into the advantages offered by Bay State's complete line. Write for bulletin to get additional facts.

BAY STATE ABRASIVE PRODUCTS CO.
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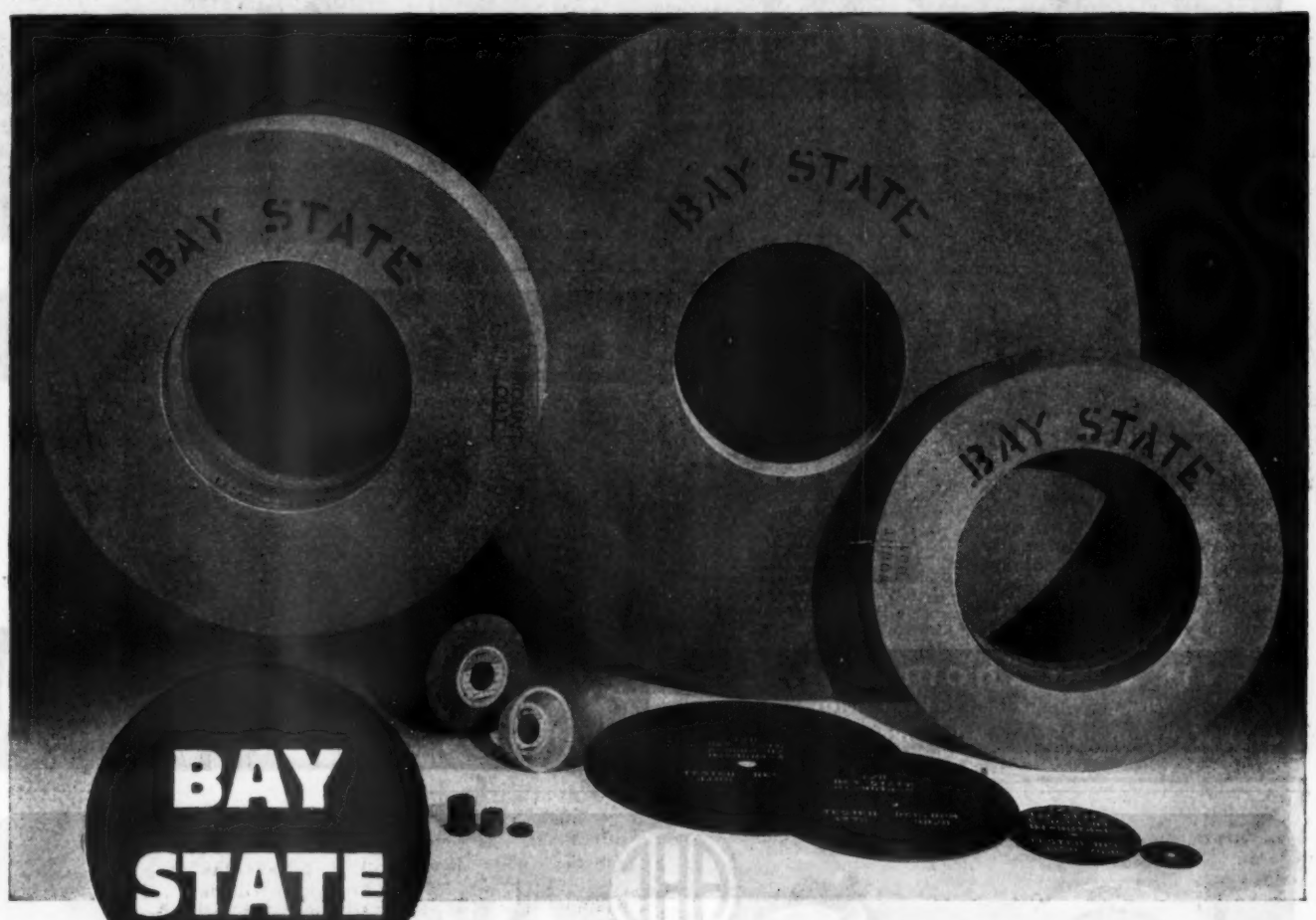

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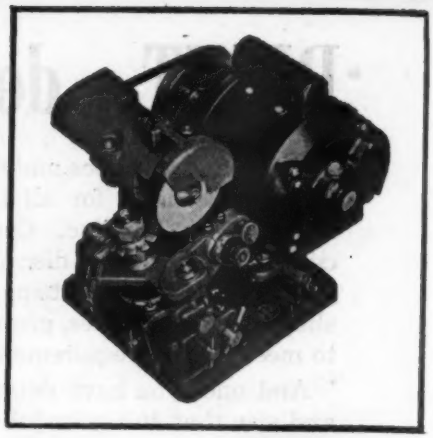
Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS

"A Sharp Tool Makes Any Machine Perform Better"

. . . ON SMALL CIRCULAR CUTTERS, USE

THE Waltham CUTTER SHARPENER



You can't expect full production and accuracy from any machine unless the cutter is properly sharpened. And you can't get full use out of your tools unless they are *kept* sharp. The Waltham Cutter Sharpener is designed specifically for keeping circular cutters at peak efficiency. This versatile machine will sharpen cutters for gear cutting and thread milling, circular form tools, straight fluted hobs and multiple cutters up to 3" in diameter and 3/8" thick—and it will keep such cutters at *original* accuracy at surprisingly low cost.

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No machine is better than the cutting edge of the tool it uses.

The coupon will bring you new Bulletin No. 344 giving full information.

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Please send me Bulletin No. 344 which describes the Waltham in detail.
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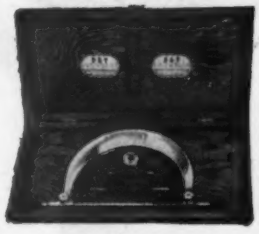

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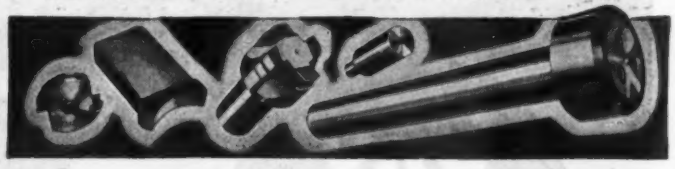

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Made in A.S.A. Standard in HEADLESS PRESS FIT, HEAD PRESS FIT, FIXED RENEWABLE, HEADLESS LINERS and SLIP RENEWABLE types—also a complete line of Accessories.

Manufactured to precision tolerances from fine grade of tool steel carefully heat treated.

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ACCURATE BUSHING CO., 440 North Ave., Garwood, New Jersey

Write For This New HAYNES STELLITE CATALOG

Tool engineers will find this new HAYNES STELLITE tool catalog a practical help in planning and operating all kinds of production machining jobs. The sample pages above show how it provides a simply arranged and complete list of the available HAYNES STELLITE tools with their specifications and prices.

In addition, this catalog tells:

1) How to make tipped tools with HAYNES STELLITE.
2) How to grind HAYNES STELLITE tools.
3) What angles, speeds, and feeds to use for turning, boring, and milling.

Write for your copy today.

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Vitrified

Cuts longer between turns

Vitrified Grinding Wheels assure economy in high quantity production fine precision grinding because they cut longer between each wheel truing. Then, too, these long life, strong wheels require less redressing. They can also be depended on to eliminate gumming, glazing and heating.

All these advantages are available regardless of the grinding job, because there is a size, shape and type Vitrified Grinding Wheel for every grinding purpose. The completeness of the Vitrified line makes it possible for any shop to standardize on Vitrified Wheels. Our engineers will gladly study your grinding operations and point out the savings you can make through the use of Vitrified Wheels.

BORITE—for all kinds and classes of steel grinding.

CARBORITE — for all classes of cast iron, brass, bronze and aluminum grinding.

Also, Silicate, Shellac and Resinoid Bonded Wheels.

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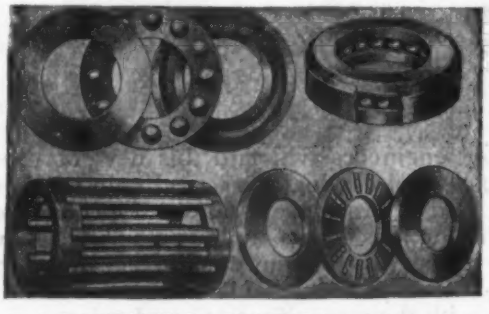

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B & R B PRECISION BEARINGS in standard sizes, special sizes to your own specifications.

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LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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FOR FASTER STOCK REMOVAL, UNIFORM SIZE AND SMOOTH FINISH . . . . . you'll find NEUBERT BAR TURNERS fill the bill

They are easy to set up, hold to size, and operate with heavy cuts and feeds and roll the work to a smooth, burnished finish.

Speed your production with NEUBERT BAR TURNERS.

Three Sizes	*Quick delivery*
⅝" capacity	$ 68.00
1" capacity	85.00
1¾" capacity	110.00

NEUBERT MACHINE COMPANY
Precision Cutting Tools
341 W. WILLOW LONG BEACH 6, CALIF.

WHY BOTH MANAGEMENT AND OPERATORS PREFER "Bumblebee" A.C. ARC WELDERS

We get better welds and more of them since we bought "Bumblebees"

- Production increases of 15% to 30% without sacrifice of quality are common.
- They consume 30% to 35% less power than D.C. welders — cut power costs.
- They provide leading kva which neutralize lagging kva caused by other equipment, relieving overloaded power lines and cutting demand charges 10% to 30%.
- Because of freedom from arc blow, deposition rates can be speeded up by increasing the amperage. This often makes it possible to use larger, longer electrodes and cut down stub end losses.
- Absence of moving parts, tough, he-man construction and top-notch insulation assure dependable, trouble-free operation — eliminate shutdowns for repairs and replacements.

It's easy to do a swell welding job with a "Bumblebee" at the other end of the cable.

- There's almost no "arc blow". You can work faster in any position and you're sure of good, sound welds every time.
- It's easy to produce sound, uniform welds in the corners and tight spots—there's less chipping out of welds.
- It's often possible to use longer and larger electrodes; there are fewer stops to put new electrodes in the holder.
- It's a simple matter to adjust the current for different kinds of work — just turn the crank.
- The current setting is always plainly visible on the big easy-to-read indicator.
- They're dependable — don't require oiling or other attention. An operator can concentrate on welding.

- **These are a few of the important advantages which are making "Bumblebee" welders favorites in plants everywhere. Others are described in the "Bumblebee" Catalog. Ask your nearest Airco office for a copy or write Dept. AM. Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas, Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.**

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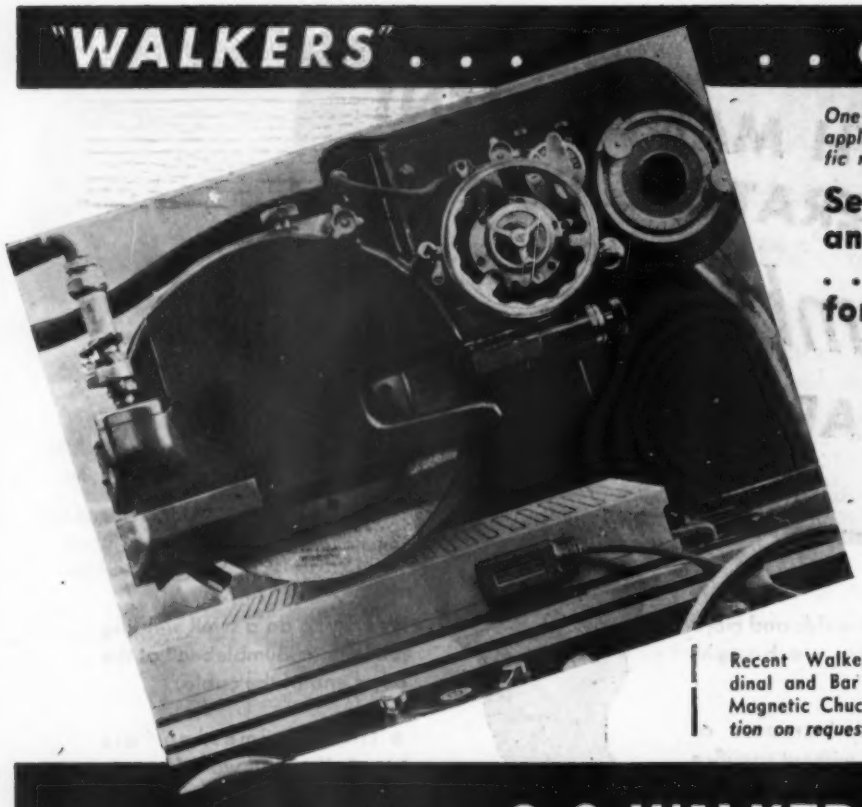
A COMPLETE LINE OF A.C., D.C. AND GAS-ENGINE DRIVEN UNITS

"WALKERS" . . . . . at work



One of a series of advertisements showing specific applications of Walker Magnetic Chucks on specific machines.

Secure holding of work and a precision machine . . . the right combination for die grinding.

Tool rooms, die shops and manufacturers of precision parts must have accuracy of plane surfaces. Requirements such as these are fully met when the chuck is a "Walker" and the machine on which it is used a "Norton," as illustrated here.

Your machine tool builder is thoroughly familiar with Walker Magnetic Chucks. Why not ask for recommendations as to how you can handle your surface grinding operations most effectively with "Walkers" on your present grinders.

Recent Walker developments include water-proof Longitudinal and Bar Pole Electro-Magnetic chucks and Permanent Magnetic Chucks in Plain and Swiveling types. *Full information on request.*

In this picture is shown a Walker Magnetic Chuck on a 12" Norton Surface Grinder arranged for die grinding.

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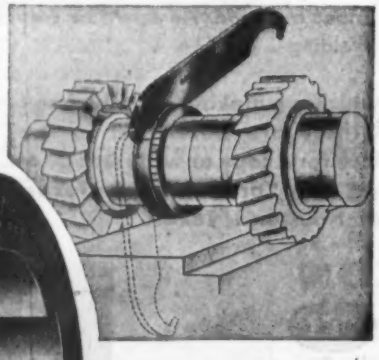
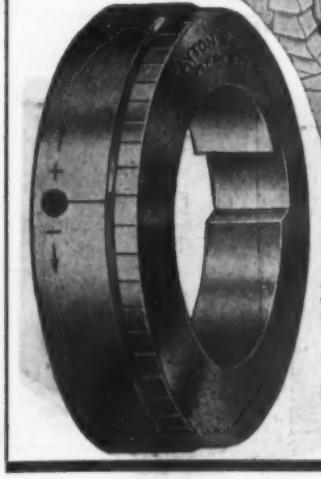
Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.





"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅞" to 2".

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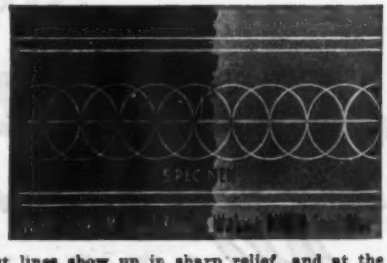

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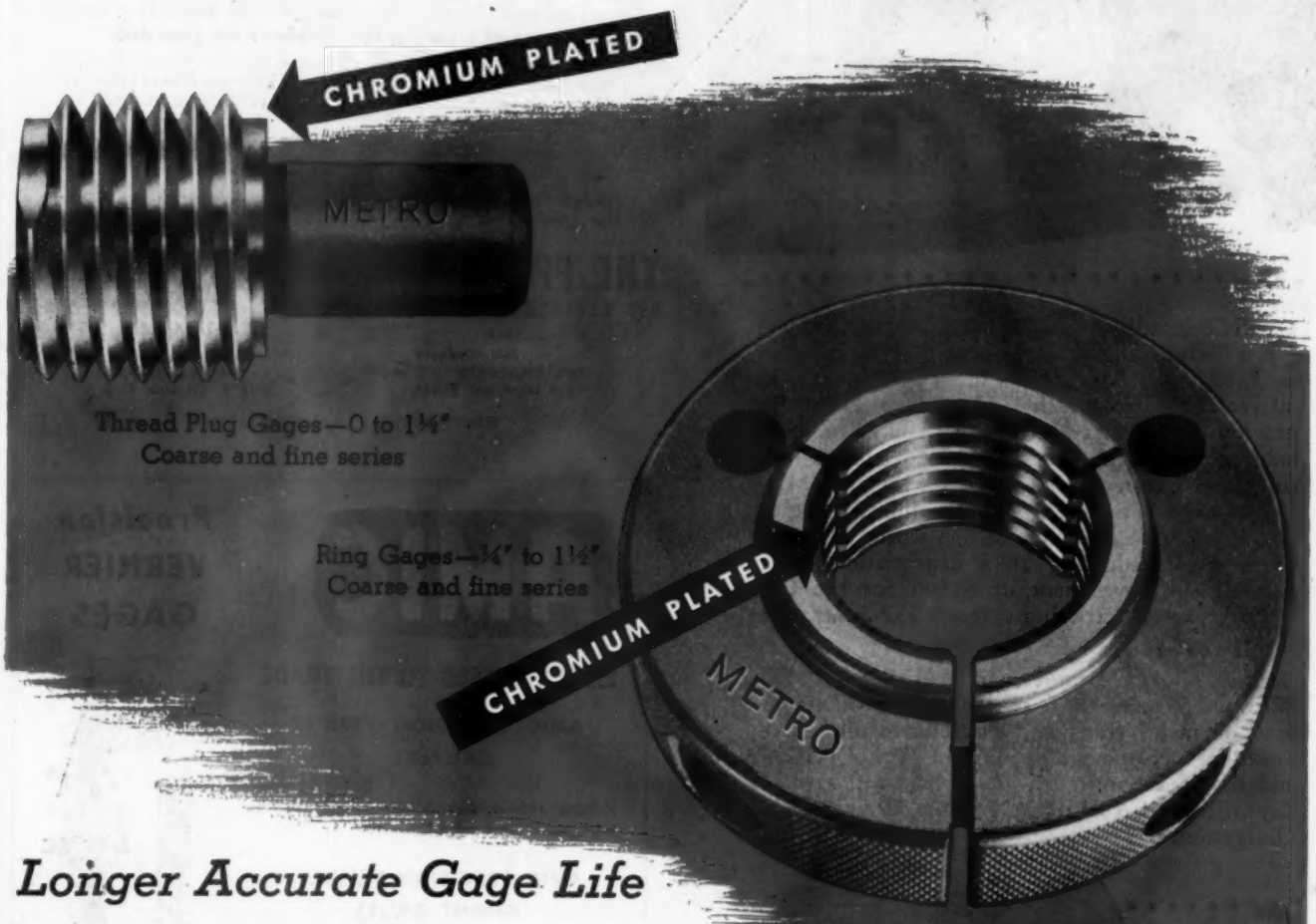

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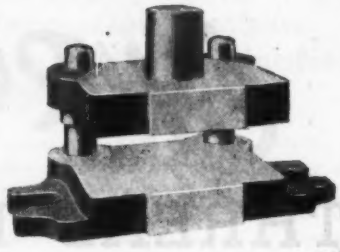

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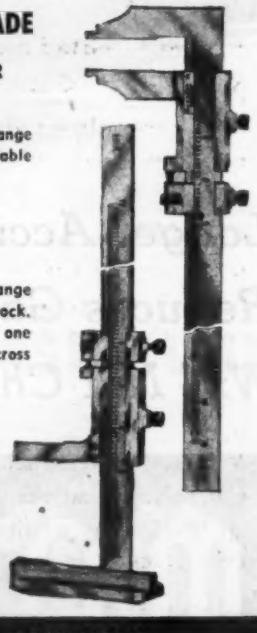

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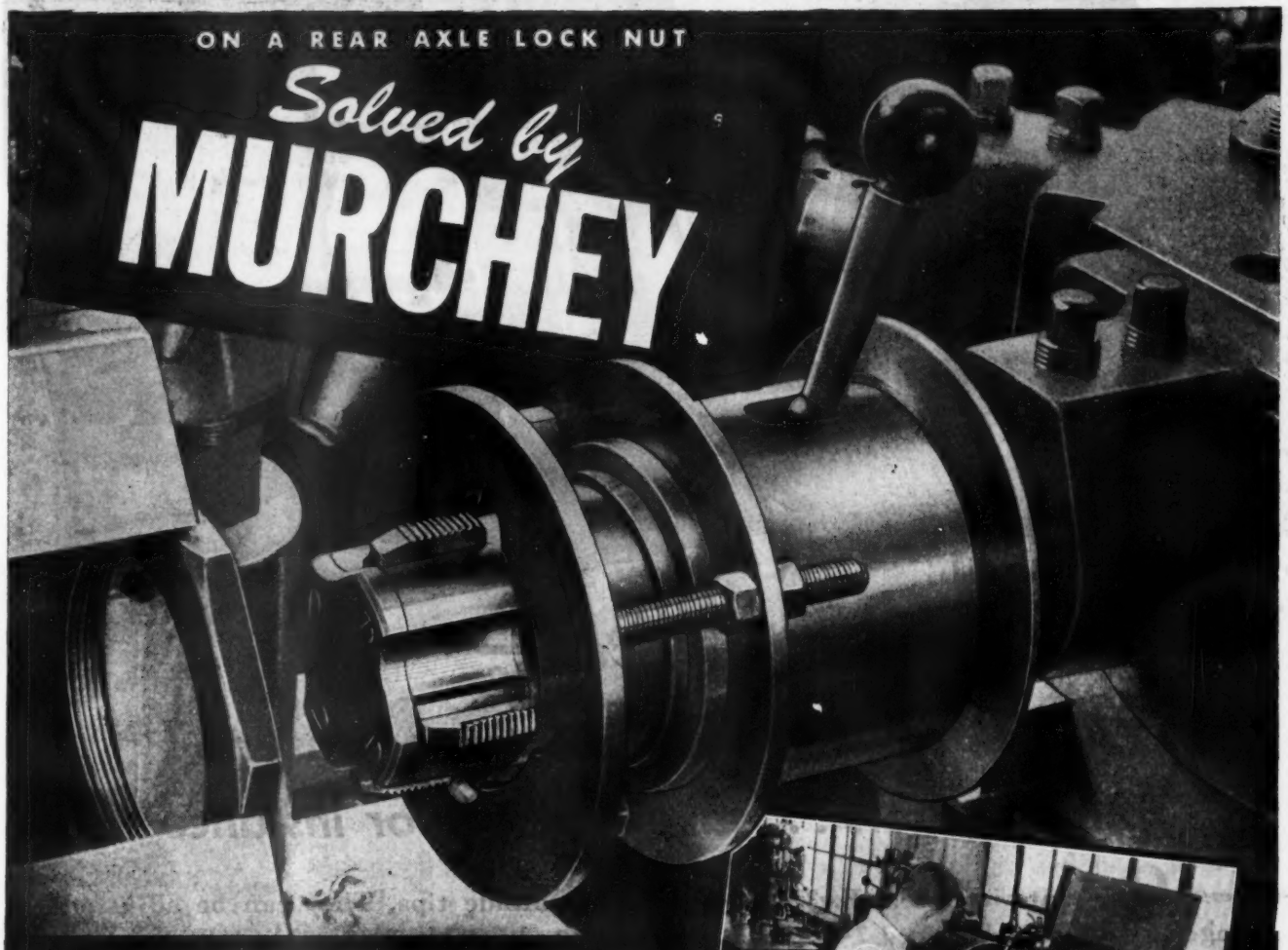
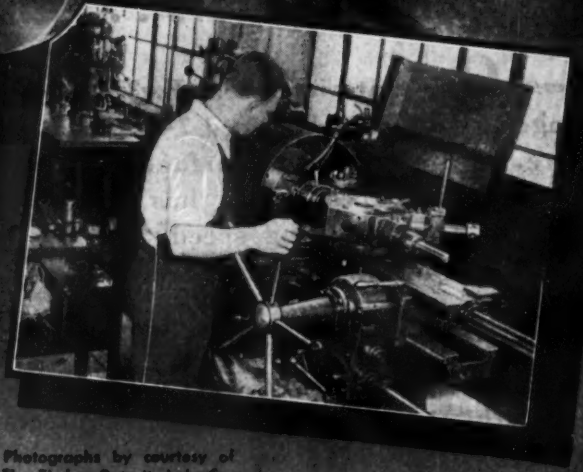
ON A REAR AXLE LOCK NUT

Solved by MURCHEY





Photographs by courtesy of The Timken-Detroit Axle Co

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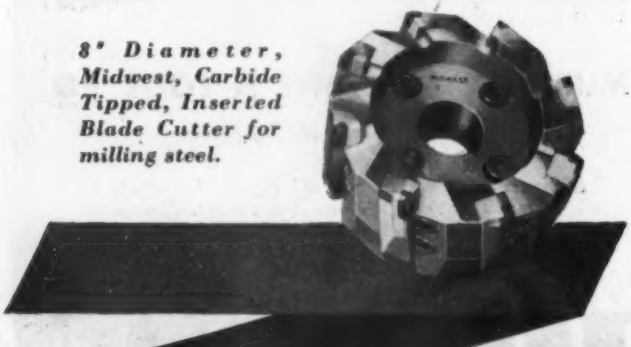

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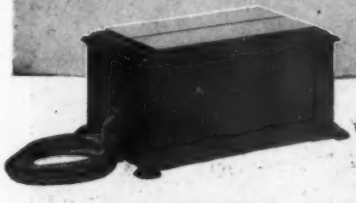

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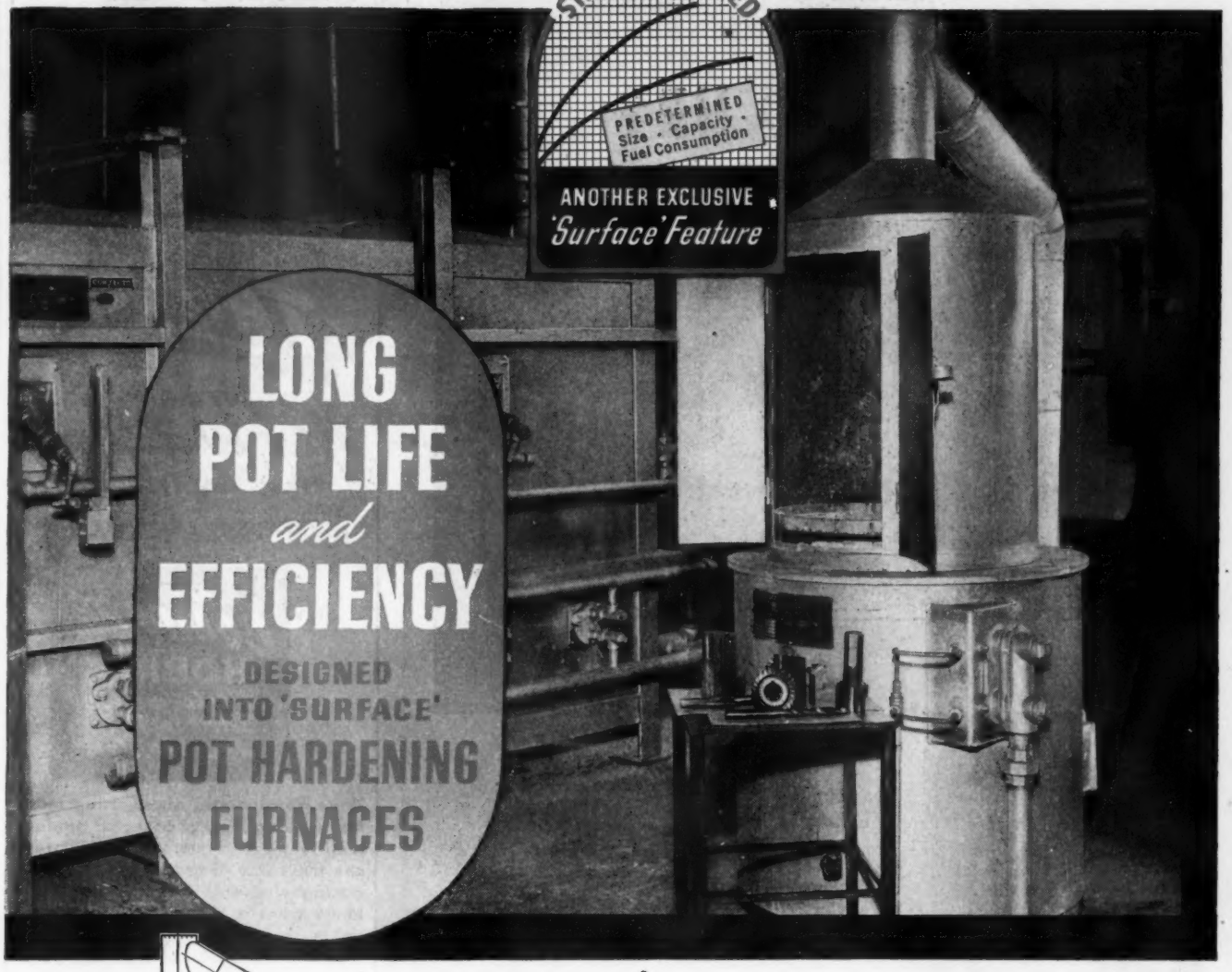

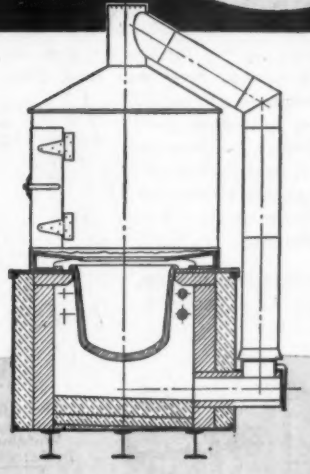

Cross Section of 'Surface' Pot Hardening Furnace with hood. Note arrangement of burners high on the sides of the pot, and position of flue carrying expended gases from the bottom of the unit.

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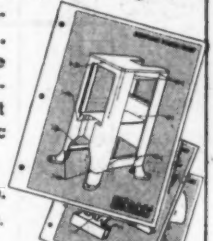

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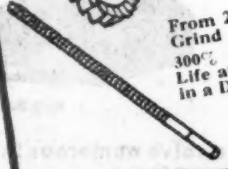

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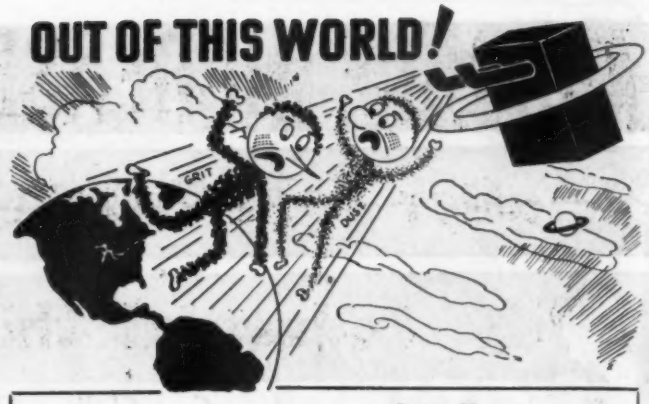

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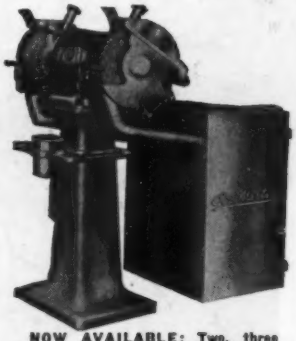

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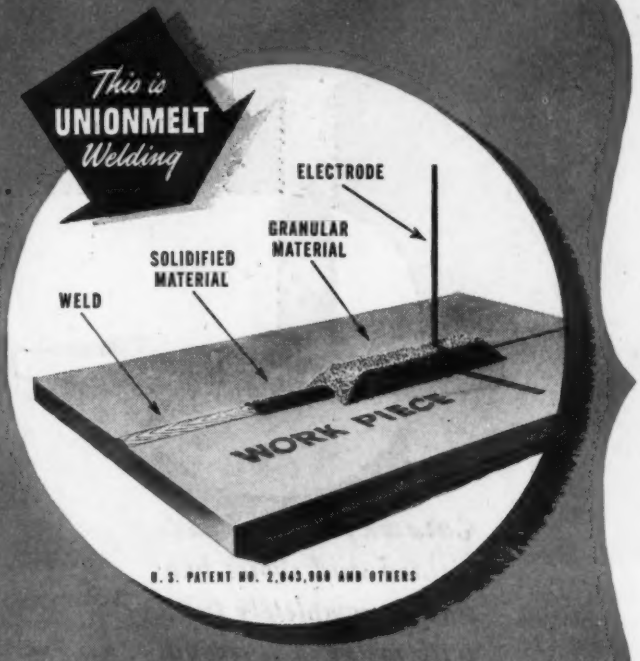
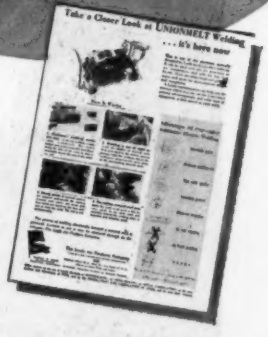


A process of welding electrically beneath a mineral melt

. . . and successful producers of other things as widely varied as airplane propellers, tanks, gun mounts, blowers, chemical plant equipment, conveyor screws, and sheet metal parts.

UNIONMELT welding is electric welding done as diagrammed above. It makes top quality welds at speeds that are greater than with any other similarly applicable process.

Anyone who wishes to use this patented invention may do so under our standard license agreement. License fees are low and based upon extent of use. Complete engineering assistance is available to licensees.



For additional information send for "Report No. 6 on the Use of Linde Methods in Mass Production" or ask a Linde representative to help you determine where you can use the UNIONMELT process advantageously.

MARITIME "M" AWARD FOR OUTSTANDING PRODUCTION ACHIEVEMENT

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

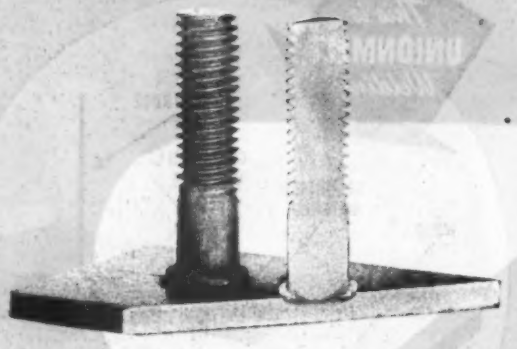
30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

The word "Unionmelt" is a registered trade-mark of The Linde Air Products Company

★ BUY UNITED STATES WAR BONDS AND STAMPS ★

Nelson Stud Welding eliminates stud drilling and tapping!



Cutaway view of end-welded stud shows how stud is completely fused with metal in ⅛ second.

Photographs by courtesy of Herbert H. Davis Co., Cicero, Ill.

Welding studs through template produces accurate duplication of parts. Studs are welded through guiding template to work underneath. The operator loads a stud into the gun chuck, inserts it into the hole and pulls the trigger. Welds are *automatically* made in an instant.

The Nelson Arc Stud Welder saves time and material because it secures studs without drilling and tapping holes. The manufacturing of air-conditioning equipment and industrial furnaces at the H. H. Davis Co. is a fine example of a typical industrial application.

The welds made with Nelson studs result in uniform work with *complete fusion* between stud and metal. Thousands are now being used by more than 650 industrial plants and shipyards. Operators can average 500 to 1000 stud welds in eight hours.

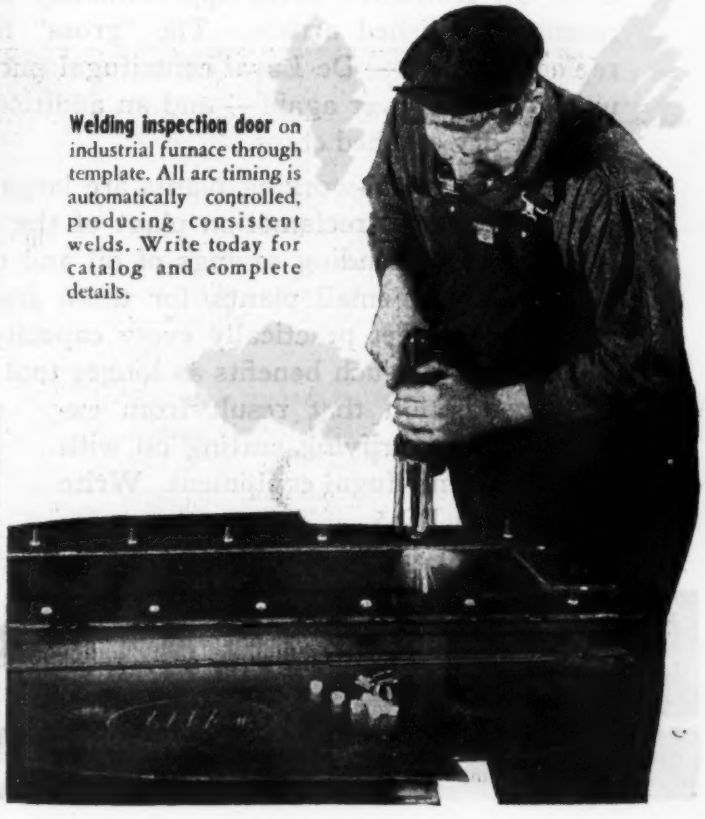
Nelson Stud Welders are fully automatic and are completely portable . . . they may be operated as a production unit or as a portable hand tool.

A template is used in welding studs to parts. Studs are welded through holes onto casing, insuring accuracy of spacing. Nelson Production Stud Welding Units, welders mounted on pneumatic cylinders and arbors, are also used where continuous production of parts is required.

Inspection plates of all kinds are welded in any position with the portable Nelson welder. Light in weight and easy to handle, it may be used efficiently in any location. Welds produced are as strong as any hand-welding method—have consistent weld fillets.

Welding inspection covers of all types is an ideal stud application. Studs are welded at desired centers to cover flange and cover secured with nuts. No holes in casing . . . close tolerances held.

Welding inspection door on industrial furnace through template. All arc timing is automatically controlled, producing consistent welds. Write today for catalog and complete details.



For catalog and prices write to

NELSON SPECIALTY WELDING EQUIPMENT CORP.

Dept. EW, 440 Peralta Ave., San Leandro, Calif.

Eastern Representative: Camden Stud Welding Corp. Dept. 122, 1416 So. Sixth St., Camden, N. J.

AT SPRINGFIELD ARMORY

De Laval Cutting Oil Reclamation System SAVES $70,000 per YEAR!

At Springfield, Mass., Armory reclamation of cutting oil and salvage of chips by means of equipment that includes a De Laval Oil Purifier and De Laval Chip Oil Extractor saves approximately $70,000 net per year, according to a recently published article. The "gross" figure includes savings of $98,000 in replacement oil — De Laval centrifugal purification enables the cutting oil to be used over and over again — and an additional $17,000 representing the premium paid for dry crushed chips.

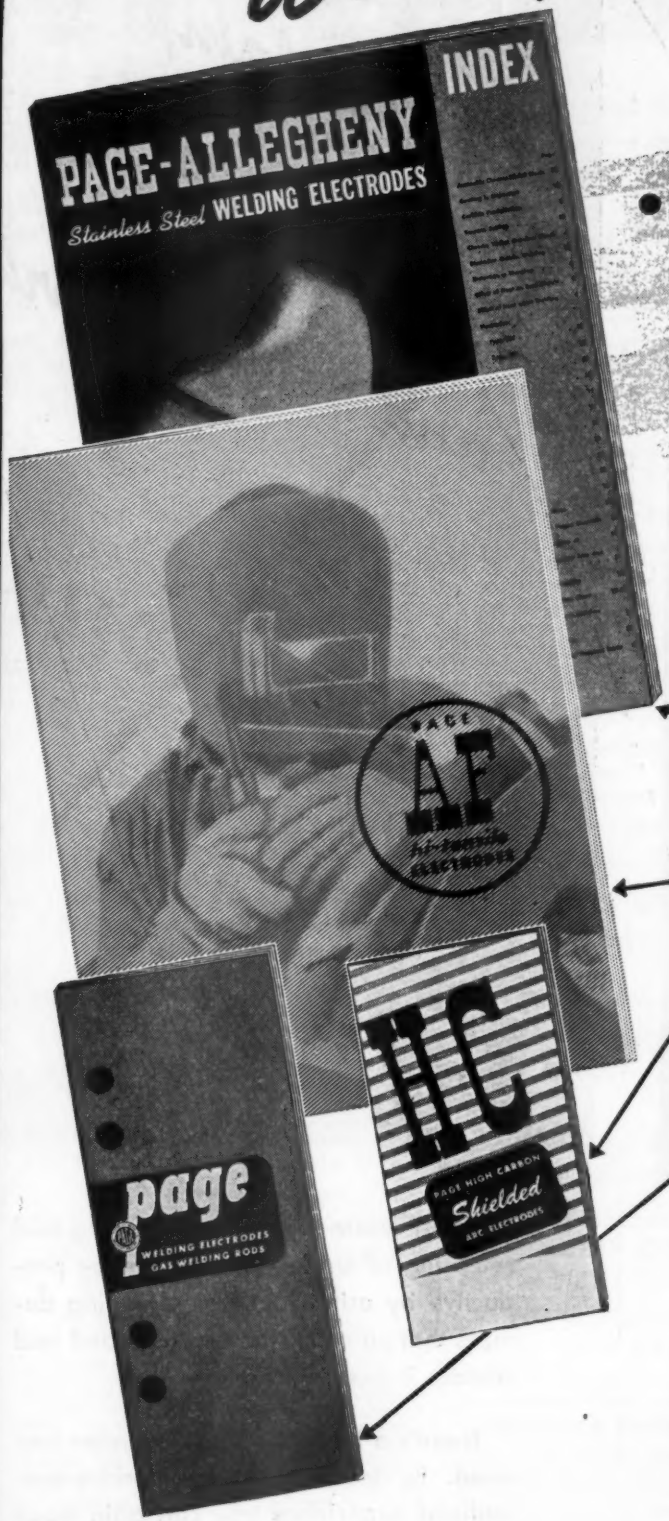
Not all metal-working plants are large enough to require a continuous chip handling and oil reclamation plant of the size installed at Springfield Armory. But the corresponding savings of oil and chips can be enjoyed by operators of even relatively small plants, for there are De Laval Purifiers and Extractors available to meet practically every capacity requirement. Every machine shop can thus enjoy such benefits as longer tool life, higher cutting speeds and lower oil consumption that result from extracting and purifying cutting oil with De Laval centrifugal equipment. Write for Bulletin FC-5.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

DE LAVAL PURIFIERS and CLARIFIERS FOR FACTORY OILS

FOR GREATER OPERATING EFFICIENCY

PAGE *Welding* ELECTRODES



...YOURS FOR BETTER WELDING

●The three booklets and the leaflet shown here are for everyday use. Their purpose is to give welders up-to-date information on the selection of electrodes for specific jobs and how to use them to get best results.

DH-1023—If you are welding stainless steel, this 24-page booklet will be of value to you. It is almost a textbook on stainless steel electrodes and their proper use.

DH-936—This booklet is much more than a description of PAGE AF Hi-Tensile Electrodes. It is a comprehensive illustrated manual on their use.

DH-1174—This is a leaflet which describes the physical, chemical and working characteristics of the PAGE High Carbon Shielded Arc Electrode. It also lists a few of its many applications.

DH-821—Probably the most all-around useful booklet of all. It is a pocket-size catalog, arranged so that the recommended electrode or gas welding rod for any one of 28 classes of production welding can be found immediately.

★ ★ ★

Ask your nearest PAGE distributor for copies of one or more of these informative pieces. Or, if you prefer, write direct to the PAGE factory at Monessen, Pennsylvania.

ACCO

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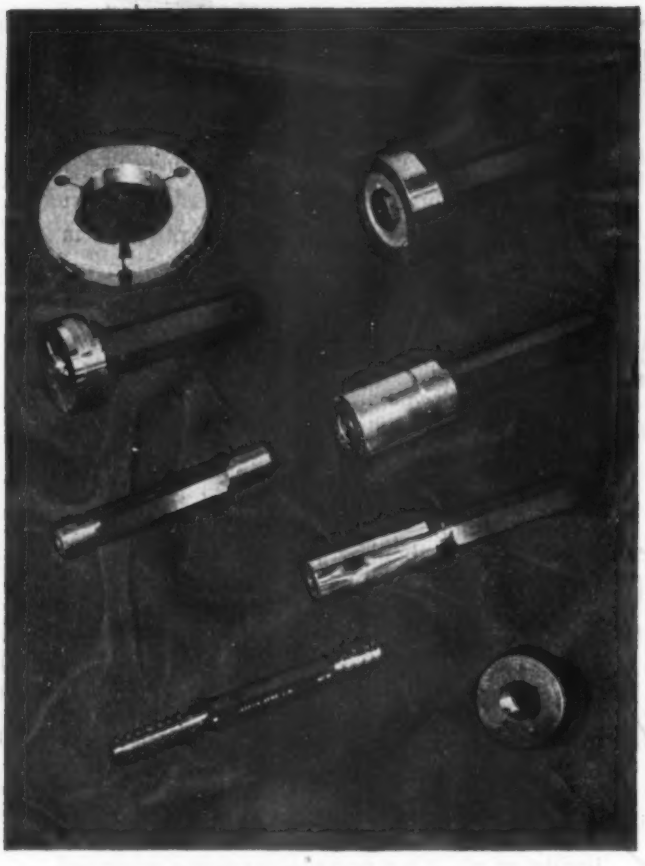
AMERICAN CHAIN & CABLE

...the standard of accuracy
...the mark of character



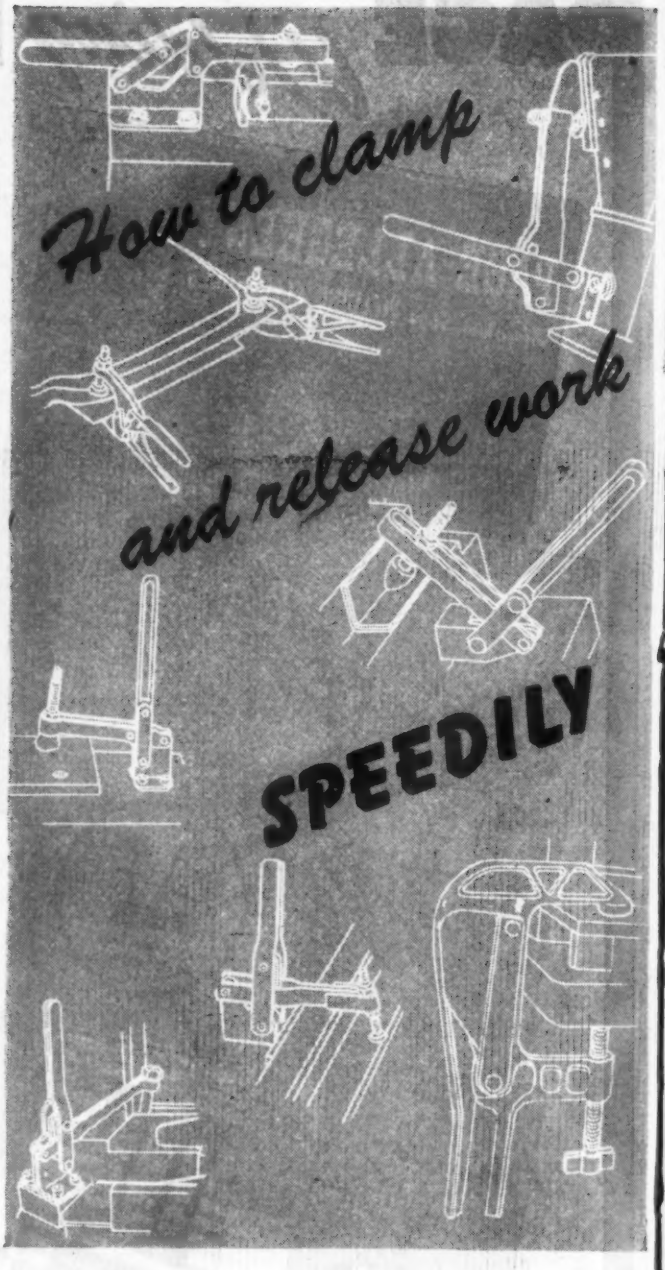
★ SCHRILLO RING AND PLUG GAGES bear the unmistakable stamp of character—in quality, precision and technical excellence. For example:

The Schrillo *Aging Process* completely relieves internal strains and prevents *gage growth*, thereby providing positive *size stability* and constant thermal expansion.

Meticulous inspection under laboratory conditions in air-conditioned, temperature-controlled testing rooms make *size control* a practical reality.

Tools of character bear the winged S that means *Schrillo.

SCHRILLO
LOS ANGELES CALIFORNIA



DON'T waste time in the clamping and releasing of work! Make that time productive by using Knu-Vise clamping devices that can lock work in a second and release it just as quickly.

There's a Knu-Vise Model to meet any need. By drawing on our extensive specialized experience you can gain much valuable help. Send for a complete catalog.

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ON A CONTRACT BASIS . . .
exactly to your specifications . . .

A complete and efficient service for the manufacture of machines and parts, special tools and fixtures, etc., is available to you in our modern, fully-equipped shop. We also offer cam milling facilities that will fit your requirements. You are guaranteed quality work at a reasonable cost.

Send your blueprints or samples today for prompt quotations at no obligation.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE CO., Bridgeport, Conn.

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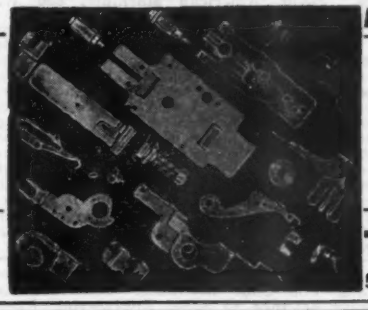
Fast Service on Long or Short Runs



"GREATER SAVINGS WITH GREIST"

We can handle your stamping and assembly requirements in any metal. Our modern equipment and methods coupled with 50 years of experience is your guarantee of accuracy and efficiency. Our facilities include capacity for handling screw machine products, tools, dies, jigs and fixtures.

Quality work by skilled mechanics is assured. Send your blueprints or samples today for prompt quotations!

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

AVAILABLE SCREW CAPACITY

¼ to 4½ Automatic and Hand Screws

Including Necessary Secondary Operation
Forward Samples and Blueprints for Quotations

BRIDGEWATER SCREW PRODUCTS CO., Bridgewater, Mass.

• TOOL DESIGNING AND BUILDING • MACHINES DESIGNED • IDEAS DEVELOPED • PROMPT—EFFICIENT—SERVICE • • REASONABLE CHARGES •

OLD COLONY ENGINEERING CO.
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Write — Phone or Telegraph

SCREW MACHINE PRODUCTS

STEEL—BRASS—ALUMINUM

MACHINE SHOP FACILITIES

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National Tool & Machine Co.
426-428 W. 55th St., N. Y. 19, N. Y.

WANTED—WORK (PEACETIME)

ON CONTRACT BASIS TO YOUR SPECIFICATIONS

We offer a complete service for the Engineering, Development, and Manufacture of metal parts, assemblies, and machines.

Fully equipped, modern machine shop with complete production setup for all types of machine work.

Send blueprint or sample for prompt quotation without obligation.

SOUTH SHORE MACHINE & TOOL WORKS, INC.
Merrick Road Seaford, New York

BUILDERS OF SPECIAL MACHINERY TOOLS & DIES

THE SPECIALTY MACHINE TOOL & DIE CO.
923 Market St. (Rear) Wheeling, W. Va.

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
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METAL STAMPINGS

• TOOLS • DIES •

PERMANENT MAGNETS

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THOMAS & SKINNER STEEL PRODUCTS CO.
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WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
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MOULD MAKERS

Specializing in molds for the Rubber Industry also facilities for automatic screw machine work up to 11/16.

M & N Machine Tool Works
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Long runs for Turret Lathe & Milling Machines.

VAHL ENGINEERING CO.
505 Court St. Brooklyn, N. Y.

SEARCHLIGHT SECTION

POSITIONS VACANT

SENIOR AND Junior Industrial Engineers, Positions now open are permanent and afford successful applicants exceptional post-war opportunities. Starting salaries are high. Qualifications: Applicants for both senior and junior positions must be graduate engineers, either in industrial, chemical or mechanical engineering. Senior engineers (ages 28-33) must have had experience in 3 or more of the following time studies, establishing standards, installing labor controls, estimating costs, installing wage incentive systems, handling methods improvement programs. Junior engineers (ages 21-27) without industrial experience will be considered. Inquiries, giving experience, marital and draft status and other pertinent information, should be directed to the Employment Manager, Union Bag & Paper Corporation, Post Office Box 570, Savannah, Georgia. Persons now engaged at highest skill in essential industry cannot be considered. Union Bag & Paper Corporation, Savannah, Ga.

DESIGN ENGINEER—Established Connecticut manufacturer needs graduate engineer or equivalent experienced in design of automatic machinery. Printing press and some tool, jig and fixture experience desired but not essential. Postwar opportunity with company whose products have international distribution. State age, marital status, education, experience, present salary and salary expected. P-352, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: CHIEF Mechanical engineer for design and development of varied radio and electrical parts and equipment. Experienced in manufacturing involving small metal stamping, screw machines, general machine work and assembly. Permanent position with ample responsibility and opportunity in well established company employing over 400. Small city with attractive living conditions. E. F. Johnson Company, Waseca, Minnesota.

WORKS MANAGER: Well established heavy industry making equipment for cutting, and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Employment in accordance with existing W.M.C. regulations. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

(Continued on page 284)

SEARCHLIGHT SECTION

WE WANT

MECHANICAL ENGINEERS
MACHINE DESIGNERS
DRAFTSMEN

Men who are capable of carrying the responsibilities involved in the creation, design, development and production of new postwar products consisting chiefly of both HEAVY AND LIGHT INDUSTRIAL MACHINERY for absorption of the expanded manufacturing facilities of our plants, now engaged in the production of Army tanks, tank parts, power units, resistance welders, etc. Only persons with well founded practical and technical experience should apply. Permanent positions at good salaries and opportunities for advancement in a growing organization are possible to those who qualify. All replies confidential. *Address* J. F. JOY, Vice President—Engineering. The Federal Machine and Welder Company, Warren, Ohio

WANTED
INDUSTRIAL CONTROL ENGINEER

We are interested in securing an electrical engineer to develop industrial control apparatus.

Applicant should be familiar with competitive designs, and have working knowledge of tests and working methods. Underwriter's requirements and NEMA standards for electric motor control.

Excellent opportunity to qualify for a permanent supervisory position in Engineering Department of an expanding organization well established in the automotive electrical and magnetic relay field. In applying give age and complete resume of experience.

R-B-M MANUFACTURING CO.
Division Essex Wire Corp.
LOGANSPORT INDIANA

METAL SPECIALIST

Well-known national concern manufacturing materials used in processing, maintenance and cleaning operations has opening for man who has had good experience in problems of metal shaping, forming and finishing operations. Splendid opportunity now and in postwar period. Location New York, some traveling. Give full details, age, experience, salary etc. If data indicates necessary experience, interview will be arranged at our expense.

BOX 567
Church St. Annex N.Y.P.O., N. Y.

ELECTRICAL ENGINEERING OPPORTUNITY

Electrical manufacturer of nationally known motor control and power distribution equipment offers permanent employment in application and field engineering work to men with electrical engineering education or equivalent experience in sale or design of electrical equipment. Also excellent opportunities for qualified young men without previous experience to receive valuable training in an essential industry having a brilliant postwar future. Give full particulars, including education, experience, age and salary expected. ADDRESS—

P-349, AMERICAN MACHINIST
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

DEVELOPMENT ENGINEER

Experienced in designing and direct development of small mechanical devices. Must have creative ability. Knowledge of plastics desirable.

Our company is well established and engaged in mass production of light metal novelties. (Located nearby New York City.)

Age 35-45. Write fully, giving details of experience, education, and salary requirements.

BOX 619, REALSERVICE
110 W. 34th St., New York 1, N. Y.

GRADUATE MECHANICAL ENGINEER

A competent and qualified mechanical engineer is wanted by a well established firm without reconversion problems.

Steam and electrical engineering plus experience in the food packing industry is desired.

Must be creative and easily adapted to varied problems.

P-366, American Machinist
520 North Michigan Ave. Chicago 11, Ill.

Experienced General Foreman for old established machine shop—permanent post-war job. Must be familiar with Vertical and Horizontal Boring Mills, Engine Lathe, Turret Lathes and Radio Drills.

P-367, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

PROFESSIONAL SERVICES

Contract Termination Specialists
CONSULTANTS, ADVISORS, NEGOTIATORS
We will assume full charge of your
TERMINATED WAR CONTRACTS
Govt. Trained—Our charges included in post termination expenses.
ROBERT L. COLLUM ASSOCIATES
Room 837 11 West 42nd St., N. Y., N. Y.

POSITIONS VACANT
(Continued from page 283)

SUPERINTENDENT: Well established heavy industry making equipment for cutting and forming sheet metal has opening. Give details of education, personal qualifications and work history in letter of application which will be held in confidence. Employment in accordance with existing W.M.C. regulations. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

PRACTICAL METAL Fabricator wanted by long established mid-west manufacturer for supervising the construction of dies and fabrication of metal panels and components in small lots required for specialized motor vehicle bodies. Must have practical experience in fabrication of metal body panels on stretcher presses, drop hammers and small toggle presses. Permanent position for right man. Write giving complete resume of experience including places worked, photograph, age and salary expected. P-354, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PRODUCT DESIGNERS to design domestic washing machines. Apply in writing giving previous designing experience, salary and references. P-370, American Machinist 330 W. 42nd St., New York 18, N. Y.

MAN of formanship caliber. Capable of setting up and running Waterbury Farrel Tubular, Hi-pro, and standard two-stroke Headers, producing rivet blanks of steel, copper and nickel to close tolerances. Must also be able to make or design own header dies. Currently running 54 hours per week. The man selected will be placed in charge of header department of our Tungsten Division. Established industry with no reconversion problem. All applications will be treated confidentially and should be as detailed as possible. Phone, wire or write to H. A. Wilson Co., Personnel Dept., 105 Chestnut St., Newark 5, N. J. Telephone Ma 2-5561.

DIE DESIGNER—preferably with experience tooling Four-Slide machines. Excellent opportunity advance to Sales Engineering Executive. Give sufficient details of qualifications and experience so can decide if interview is desirable. Location, Northern New Jersey. P-372, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MECHANICAL TUBING Executive young or middle-age individual capable of supervising gas weld continuous tube rolling equipment as well as all details concerning hydraulic press bending operation, estimating of automotive exhaust pipe etc. P-374, American Machinist 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

EXECUTIVE in small shop up to 1000 employees, in small town situated in Middle West, South West, or West Coast. Practical shop man thoroughly familiar with modern machine shop mass production methods ranging from blue print stage, thru processing, design, tooling, estimating, plant layout, etc. First class organizer and producer with the equivalent of a college education arrived at the hard way. Salary secondary to pleasant, harmonious surroundings. Middle aged, family man, 35 years in Detroit and Michigan. PW-342 Amarican Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EXECUTIVE—Looking for permanent position as works manager, factory manager or technical director, graduate engineer with shop and organization experience on metal fabrication and machining operations. Experience in product engineering and development; production engineering and control; industrial engineering; welding engineering; training and personnel control. PW-356, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 286)

TO ABLE, AMBITIOUS MEN

in Administration, Manufacturing, Engineering, Designing and Sales, who have good reasons for seeking wider opportunities, we offer AT NO CHARGE a dignified means of bringing their qualifications before interested employers.

To industry we offer confidential Personnel Management Service on a fee or retainer basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

Additional Employment Advertising on pages 283, 285 and 286

WANTED

MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional post-war opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-345, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Wanted

DESIGNERS—DRAFTSMEN AND ESTIMATORS FOR PERMANENT POST-WAR POSITIONS

Prefer men experienced in rolled metal products used as bright trim and decorative mouldings for automobiles, refrigerators, washing machines, stoves, etc. No reconversion problems involved. This is an unusual opportunity for men who possess experience, originality and initiative to join a well-established and growing organization, which is considered a leader in its field. Write full details of education, experience and salary expected, and we will arrange an interview for you.

MOULDINGS, INCORPORATED
730 E. Washington St. Indianapolis 2, Indiana

ASSISTANT TO VICE PRESIDENT

Unusual opportunity for man with good basis mechanical knowledge to grow with successful New York organization specializing in national and export distribution of high grade machine tools and related equipment. Must be facile correspondent with good business judgment. Written application must contain complete details. Compensation commensurate with performance.

P-368, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEERS ELECTRICAL ENGINEERS

Engineers experienced in Machine Design and Sheet Metal Products or Household Appliances.

Must have successful pre-war background. Permanent position with large, progressive organization. In replying give full particulars, places worked, projects, etc.

Institute of Product Research
Dept. LAH—448 S. Hill Street
Los Angeles 13 California

WANTED

ENGINEERS MACHINE DEVELOPMENT

Graduate engineer or equivalent, experienced in the design and development of special and experimental machines. Men with creative ability required, experienced in such lines as automatic, semi-automatic, or ordnance equipment. Must be thoroughly acquainted with modern methods and shop practices and capable of developing new ideas in conjunction with modern mechanical laboratory facilities.

State age, marital status, details of education, experience, draft status, present salary and salary expected. Enclose recent photograph or snapshot.

Post-war opportunity.

Applicants must be able to obtain Statement of Availability.

E. I. du Pont de Nemours & Company, Inc.
Personnel Division
Wilmington 98, Delaware

WANTED

MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

THE TAFT-PIERCE MFG. CO.
Woonsocket, R. I.

ENGINEERS AND DRAFTSMEN

Excellent opportunities for draftsmen and designers on war and postwar precision machine tool work. Permanent openings with excellent prospects for aggressive men. Give full details and salary expected in first letter. Write to:

Personnel Manager
The Heald Machine Company
Worcester 6, Mass.

WANTED

MACHINISTS MACHINIST OPERATORS TOOL MAKERS

Permanent full-time employment with America's leading manufacturer of oilfield equipment. Now building vital war materials but has a definite post war future. Living facilities available.

Cardwell Manufacturing Company, Inc.
Box 2001 Wichita, Kansas

WANTED

MASTER MECHANIC

An old, well established organization in New Jersey, near New York City, desires the services of a master mechanic, experienced in all phases of manufacturing aluminum containers, including die making, knowledge of work planning, modern work methods and shop practices, and be capable of assuming supervisory authority. Applicants should state full particulars, such as details of experience, salary expected, references, age and other data of background in letter of application. All correspondence will be treated strictly confidential.

P-365, AMERICAN MACHINIST
330 W. 42nd Street New York 18, N. Y.

WANTED

PRODUCTION MANAGER

Man experienced in planning, scheduling machine loading and inventory control with experience in small lot production. Machine Shop and sheet metal experience an asset. Excellent post war prospects with an old organization in the middle West.

P-335, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED
(Continued from page 284)

PRODUCTION ENGINEER or Works Manager, 30 years of practical experience in designing and building precision tools for high production, desires permanent position with responsible manufacturer. PW-326, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EXECUTIVE WITH diversified experience in machine work, metal stamping, welding, gray iron casting and assembly. Have been in charge of design and construction of tools, dies, jigs, fixtures and special machinery for the past 3 years. Graduate Mechanical engineer. Age 47. Healthy and very active Machine Tool work, Chief engineer and/or master mechanic position desired. Or what have you to offer? PW-375, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

DEVELOPMENT ENGINEER (M.E.) Five years in research department large industrial concern developing new automatic production machinery, additional five years development work on mechanical and hydraulic presses and automatic container machinery. Experienced in supervision and shop methods. Analysis and theory a speciality. Responsibility essential. Age 33. PW-376, American Machinist, 330 W. 42nd St., New York 18, N. Y.

FACTORY MANAGER or Production Executive. Age 44 with 21 years' experience in metal goods manufacturing. Extensive knowledge of production planning, layouts, costs, job evaluations, time study, quality control inspection and personnel management. Jobbing and mass production operations, heat treating, metal finishing, assembly and tool room operation. Have excellent rating for management of division with 3,200 employees and company with 1,500 inspections. PW-377, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATTERNMAKER. GENERAL pattern shop experience 35 years both wood and metal. Estimate costs and lay out work so will produce accurate sound castings from your prints. Capable of taking over shop, train apprentice and produce days work from patternmakers. First class mechanic myself. Can call bluff by doing days work on hard jobs when necessary or working foremen in small shop. Age 51, American, married, two children. Have W. M.C. clearance. State salary in reply. Will go any place. PW-371, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PLANT MANAGER Superintendent. Seasoned Executive Engineering graduate age 42. Broad managerial, engineering and shop experiences on light and heavy work. Experience in engineering design, development, and modern methods, Union and non union labor. Change desired and furthering of abilities. PW-373, American Machinist, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITIES

PATENTS FOR sale cut-right. Single action one operation drawing and trimming dies for deep or regular cylindrical, rectangular, irregular shape articles with or without a flange. Dies in service can be rebuilt to include this device at very moderate expense. Burnett Menkin, 661 East 175 St., Bronx, New York, N. Y.

MACHINE SHOP, well equipped, established many years serving logging, sawmill, and farming area, Western Oregon college town. Columbia Engr. Co., Porter Bldg., Portland 4.

PATENT ATTORNEY

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6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle. New in 1943. Bargain.

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.

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100" Niles-Bement-Pond Bor. & Turn. Mill.
48" Gisholt, vert. Boring & Turning Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20"x67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

3' 9" col. American, S.P.D.
3' Dreses, 10" rd. col. QCG., M.D.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.

MULTIPLE DRILL

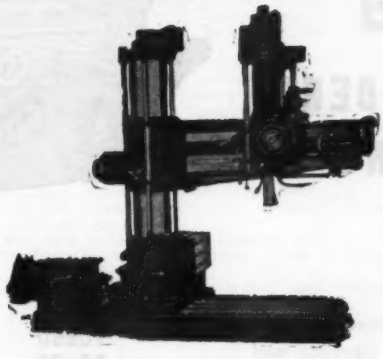
Fox #15H 54 spindle hydraulic feed.

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
14"x36" Cincinnati, Plain, motor in base.
6"x32" Norton Cyl., overhead c/s drive.
#1 Wilmarth & Morman hand surface Grinder

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

Hendey 14" x 6' Toolroom Lathe, Taper
14 x 6 Pratt & Whitney semi—Q.C.G.
16 x 8 Hendey Arranged M.D., Taper.
Lodge & Shipley 16" x 8' 12-Speed G.H.
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
20 x 10 Lodge & Shipley, G.H., M.D., Taper.
Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).

MILLING MACHINES

#3, #4, #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Millers.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C. B.G. Forging 3" stroke.
#1, Bliss-"Stiles", Plain flywheel.
105-ton Waterbury-Farrel O.B.I., M.D., hi-spd, power Press, double roll feed. 1" stroke, Bed 37" R to L, 20" F to B.
#4 Erdle, Stiles type, 1½" stroke.
#35 Niagara back flywheel, geared.
#22 Wells, back flywheel. Open back.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
7—25 ton Model SL2 K. R. Wilson hydraulic Presses.
Beck Duplex Embossing Press.

SHAPERS AND GEAR CUTTERS

14" Rockford crank shaper.
26" Cincinnati Triple Geared, Belt Dr.
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
No. 2 Baker Keyseater.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Niagara #98 Production Power Brake & Folder. 72"x14 ga. cap. Equal to new.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #9S Power Seamer.
Niagara 4" x 42" Geared Slip Roll Former.
Niagara 3" x 36" Geared Slip Roll Former.
Niagara 48" Roller Leveller. 6 Roll.
Niagara #30 Beader & Flanger.
Niagara #0 Beader.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open die, ½" cap. & 6'.

Manville Cold Header, single stroke, solid die, 3/16" cap.

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
Standard Automatic Drop Hammer, 300#.

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CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x96	16x36	

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200 H.P. Hor. 4 Pl. Motor Driven Pump, Capacity 78 G.P.M. 4000#
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50 H.P. Vert. Triplex Pump—24 G.P.M.—2500#
200 H.P. Horizontal 4 Pl. Pump—200 G.P.M.—1500#
18"x15' Accumulator 1500#
500 ton down moving ram hydraulic press 42" stroke, 28" between rods.

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Boring Mills, 36"-42"-52"-72"-96".
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Lathes, 20" to 30" Geared Head, M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
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Shapers, 10"-20"-24"-36".
Shaper, 36" Morton, Draw Cut
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DRILL—RADIAL—FOSDICK 3½', G.B., M.D.
KEYSEATER—MITTS & MERRILL No. 6, M.D.
MILLER, PLAIN—MILWAUKEE No. 2-B, Double Over-Arm, M.D.
PLANER, METAL—WOODWARD & POWELL 30"x30"x8', 1 rail head, 1 side head.
SAW, METAL CUTTING HAND—Marvel No. 8, cap. 18"x18".

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AUTOMATICS, Acme 9/16" & 1⅝" Model C 5 spdle.
AUTOMATICS, Acme 2 & 3" Model B 4 spdle.
AUTOMATICS, Gridley, 9/16", ⅞ & 1¼" Mod. G.
AUTOMATICS, Cone, 1¼ & 1½" 4 spindle, M.D.
AUTOMATICS, Gridley, ¾, 1¼, 1¾, 2¼" & 2⅝" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¾" S. S.
AUTOMATICS, Cleveland 1¼, 1½, 2, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, New Britain #22 and 24 Chuckers
AUTOMATICS, New Britain, ⅝x3¾" & 1x5" M.D., Bar Eqpt.
AUTOMATICS, Potter & Johnston #5a & 6a, M.D.
BORING MILLS, 30" Bullard, M.D.
BORING MILLS, Rockford, 3½" bar, Horizontal, 24x72" table, M.D. & 2½" Cleveland
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GENERATOR, Gleason Spiral Bevel Gear, 10"
GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hyd. 2 m.d.
GRINDERS, Bryant #3, 6 & 18 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 12" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14x6' & 20"x8', M.D.
LATHES, Lodge & S, 20"x10' Q.C. M.D.
MILLING MACHINES, #2 B Hvy. B&S Plain
MILLING MACHINES, #2 B Rockford Universal
MILLING MACHINES, Becker Vertical #5 & 6
PLANER, Ohio 42"x42"x12' One Head. M.D.
PLANER-SHAPER, 30" Cincinnati, M.D.

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No. 2A and 3A Brown & Sharpe Universal, m.d., taper spindle nose
No. 0-8 Cincinnati Plain, model EA, m.d., latest type
No. 2B Brown & Sharpe Plain, double overarm, m.d. in base
No. 3B Brown & Sharpe Plain, m.d.
No 3B Milwaukee Plain, double overarm, m.d.
No. 4 Cincinnati Plain High Power, m.d.
No. 5B Heavy Brown & Sharpe Plain, md.
No. 3 Garvin Hand Milling Machine, m.d.

VERTICAL MILLING MACHINES

No. 2M Cincinnati, power feed rotary table, m.d. in base, latest type
No. 2 Brown & Sharpe, s.p.d.
No 3 Cincinnati, m.d.
No. 3B Milwaukee, m.d. in base
No. 3B Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 4 Cincinnati, m.d.
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d., 28" table

MANUFACTURING MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest type
No. 1-8 Kent-Owens Hydraulic, m.d., latest type
No. 34-36 Cincinnati Duplex Hydromatic, m.d., latest type, with tracer control
No. 4-36 Cincinnati Plain Hydromatic, m.d., latest
Hall Planetary Thread, m.d.
4½x12" Pratt & Whitney Thread belt
6x14" Pratt & Whitney Thread, belt
6x20" Pratt & Whitney Type B Geared Head Thread, m.d. in base
6x48" Pratt & Whitney Thread, m.d.
6x80" Pratt & Whitney Thread, m.d.
18" Cincinnati Plain Automatic, m.d.
24x6' Ingersoll Slab, m.d.
28" Cincinnati Plain Automatic, s.p.d.
30"x21"x20' Ingersoll Slab, m.d.
36"x36"x14' Bement Slab, m.d.
54"x54"x10' Liberty Planer Type, with Cincinnati Milling Head, m.d., p.r.t.
Burr Mfg. m.d.
Becker Lincoln Type, cone
Carter & Hakes, motorized
No. 2 Pratt & Whitney Lincoln Type, cone
No. 12 Pratt & Whitney Lincoln Type, cone

RADIAL DRILLS

3' American Sensitive, belt
3' Dreses Plain, gear box
3' Fosdick Sensitive, belt
3½' American Triple Purpose, m.d.
4' American Triple Geared, m.d.
4' Cincinnati-Bickford Plain, m.d. on arm
4' Cincinnati-Bickford Plain, gear box on base, 32 speeds
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, m.d.
5' Carlton Plain, m.d., 13" column
5' Cincinnati-Bickford Plain, m.d.
5' Cincinnati-Bickford Plate Hole Driller, m.d.
5' Dreses Plain, m.d.
5' Prentice Plain, m.d.
6' Cincinnati-Bickford Full Universal, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Reed-Prentice Plain, m.d.
6' Western Plain, m.d.
7' Cincinnati-Bickford Plain, m.d.
8' American Triple Purpose Plain, m.d.
10' American Triple Purpose Plain, m.d., 22" column dia.

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3" Gleason Straight Bevel, m.d.
6" Gleason Straight Bevel, m.d.
8" Gleason Mfg. Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
12" Gleason Straight Bevel, m.d.
48" Cleveland Gear Hobber, m.d.
No. 3-26" Brown & Sharpe Spur Gear Cutter
No. 3-26" Cincinnati Spur Gear Cutter
No. 3-36" Brown & Sharpe Spur Gear Cutter
No. 4-36" Brown & Sharpe
No. 6-60" Brown & Sharpe
Cincinnati Gear Burnisher, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.
No. 2HS Lees-Bradner Spur & Helical Gear Grinder, m.d.
No. 13LS Fellows Gear Lapper, m.d.
No 36B Gould & Eberhardt Spur & Bevel Gear Cutter, m.d.
No. 36S Gould & Eberhardt Spur Gear Cutter, m.d.
No. 61 Fellows Gear Shaper, belt
No. 64-S Fellows Gear Shaper, m.d.
Cross Gear Tooth Rounder, m.d.

PLANERS

24"x24"x6' G. A. Gray, 1 head, m.d.
24"x24"x6' Pond, belt, 1 head
30"x30"x10' American, 1 head, belt
30"x30"x10' American, 2 heads, belt
30"x30"x14' G. A. Gray, belt, 2 heads
36"x36"x10' Niles, 2 heads, belt
36"x36"x12' Powell, m.d., 2 heads
36"x36"x12' Woodward & Powell, m.d., 3 heads
36"x36"x16' G. A. Gray, m.d., 2 heads
36"x36"x18' Niles-Bement-Pond, reversing m.d., 2 heads
36"x36"x20' Cincinnati, belt, 2 heads
36"x36"x20' G. A. Gray Extra Heavy Pattern, belt, 2 heads
36" widened to 44"x36"x20' G. A. Gray, reversing m.d., 2 heads
42"x42"x26' G. A. Gray, m.d., 2 heads
48"x48"x30' Cincinnati, m.d., 4 heads
48"x48"x40' Sellers, reversing m.d., 2 heads
50"x48"x32' Niles-Bement-Pond, reversing md., 4 heads
60"x60"x20' Cincinnati, m.d., 4 heads, p.r.t.
60"x60"x20' G. A. Gray, m.d., 4 heads
66"x60"x40' Niles-Bement-Pond, reversing m. d., 4 heads, p.r.t.
72"x72"x24' Niles-Bement-Pond, reversing m. d., 4 heads
96"x72"x18' Pond, m.d., 4 heads

TURRET LATHES AND SCREW MACHINES

No. 2B Foster Universal, m.d., chucking
No. 2 Pratt & Whitney Shaver, m.d.
No 3A Warner & Swasey Universal Hollow Hexagon, m.d., bar equipment
No. 3A Warner & Swasey Universal, m.d., chucking equipment
2½x24" Jones & Lamson Geared Head Turret, m.d., bar
3x36" Jones & Lamson Geared Head Flat Turret, m.d., bar
3x36" Jones & Lamson, m.d., chucking
2 spindle 3x36" Jones & Lamson, m.d., chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d., chucking
3½x32" Jones & Lemson Geared Head Flat Turret, m.d.
18" Libby Type A Turret, m.d., chucking, 3½" hole
20"x7' American Turret, cone
24" Gisholt, cone
24" Steinle, m.d.
26" Libby Type C, m.d., 7½" hole in spindle
26" Libby Type C, m.d., 4½" hole in spindle
28" Gisholt, cone
Woods Tilted Turret, Model D, cone

SHAPERS

24" Gould & Eberhardt, m.d. thru gear box

RIVETERS

Hanna Bench Type Air, 8" throat
½" Shuster, belt
Hanna Air, 13" throat
No. 3A High Speed Riveting Hammer, m.d.

SAWS

No. 3 Nutter & Barnes, belt
No. 8 Nutter & Barnes, m.d.
Burr Cold Saw, belt
20" Burke Gold Saw, belt
No. 5 Cochran-Bly Cold Saw, belt
No. 6 Cochran-Bly Cold Saw, belt
No. 11½ Higley Cold Saw, belt
Espen-Lucas Cold Saw No. 138, m.d.
No. 15 Lea-Simplex Cold Saw, belt

ROLLS

No. 3 Ajax Forging Rolls, m.d.
No. 4 Hilles & Jones Straightening Rolls, m.d., cap. 1" plate

SHEET METAL MACHINERY

No. 30A Quickwork Rotary Shear, m.d.
No. 2 Bethlehem Rotary Shear, 32" throat, ¼" cap.
No. 3 Gray Sheet Metal Cutter, cap. 5/8", 36" throat
Southwark Rotary Metal Cutter, cap. 3/8", 36" throat
8' Robinson Apron Brake, cap. 10 ga., belt
McCabe Pneumatic Flanger, cap. ½"
8' Niles-Bement-Pond Hand Flanger, ¼" cap.
No. 2 Campbell Nibbler, m.d., cap 3/8"
Quickwork Rolling Machine, cap. 18 ga.

SLOTTERS

10" Newton, cone
12" Bement-Miles, var. speed m.d.
12" Niles, m.d.
15" Canada, m.d.
48" Niles-Bement-Pond Geared, reversing m.d.
No. 1 National Acme Screw Slotter

TAPPERS

No. 1 Garvin Knee Type, belt
No. 5 Webster & Perks 5 spindle Vertical Nut Tapper
6 spindle ½" Acme Semi-Automatic Nut Tapper, m.d.
½" Rickert-Shaffer, belt

MISCELLANEOUS MACHINERY

Gisholt Precision Balancing Machine, m.d.
Anderson Filing Machine, m.d.
No. 2 Cochrane-Bly Filing Machine, belt
Strong, Carlisle & Hammond No. 5A Frankfort Gas Furnace
No. 1 Stewart Blast Furnace
Detrick & Harvey 2 spindle Profiler
No. 12M Morey 2 spindle Profiler, m.d.
No. 12 Pratt & Whitney 2 spindle Profiler
No. 11 Cochran-Bly Saw Sharpener
No. 11S Cochran-Bly Saw Sharpener, m.d.
No. 1 Leighton Type Straightening Machine, new
Wagner Saw Sharpener, belt

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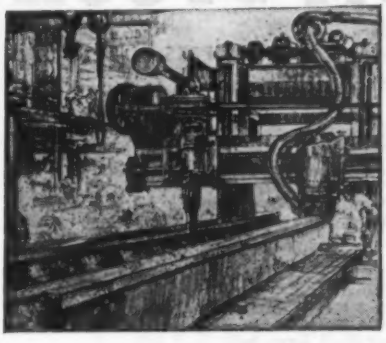

By Simmons

Every machine listed in this column is in our warehouse at press time.

24" BULLARD NEW ERA Vertical Turret Lathe
42" BULLARD NEW ERA Vertical Turret Lathe
100" N.B.P. Vertical Boring
120" CINCINNATI Vertical Boring
120" BETTS Vertical Boring
120" NBP Vertical Boring
10-16' CINCINNATI Vertical Boring
No. 32 LUCAS Horizontal Boring
4' AMERICAN Plain Radial
5' American Universal Radial
6' CARLTON Plain Radial
8' NBP Plain Radial
12" O.S. WALKER Surface Grinder
NO. 16 BLANCHARD Grinder
16"x8' AMERICAN Lathe
27"x12' AMERICAN Lathe
42"x36' PUTNAM G. H.
48"x30' BRIDGEFORD G. H.
48"x30' NBP G. H.
48"x58' BRIDGEFORD BORING
3B B&S Plain Miller
3B MILWAUKEE Plain Miller
No. 4 CINCINNATI H.P. Plain
No. 4 CINCINNATI H.P. Vertical
42"x26"x12' INGERSOLL Planer Type Milling Machine
36"x36"x14' PUTNAM Planer
36"x36"x14' OHIO Planer
48"x48"x15' NBP Planer
48"x48"x24' NBP Planer
48"x48"x32' GRAY Planer, four heads 230 V.D.C. reversing motor drive
48"x48"x20' PATCH Planer
60"x60"x12' NBP Planer
72"x72"x18' NBP Planer
16'x10'x30' BETTS Planer
NO. 3 HILLES AND JONES Plate Planer
5" Capacity Alligator Shear
12" SELLERS Crank Slotter
15" NBP Crank Slotter
20" SELLERS Crank Slotter
42" PUTNAM Car Wheel Lathe
42" PUTNAM Car Wheel Borer

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N. Y. Office: 50 East 42nd St.

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HORIZONTAL
2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL
66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 15" M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10, 11 Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, B.D.G.
20"x14' Rahn-Larmon, raised to 24"
14x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M. D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6, 6F Hand Screw
B. & S. No. 00, 0
5 Spdle Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P. & J. 6A, M.D.
⅞" Cone 4 spindle

GEAR CUTTERS

No. 2, 12 Barber-Colman Gear Hobber
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel
G. & E. 60" gear cutter

SHAPERS

24" P. & J.
16", 20", 26", Stockbridge
20", 24" G. & E., M.D.

RADIALS

3', 4', 5', 6', 8' American Triple Purpose
3', 3½', 4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

10" P. & W. Auto.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 2, 3 Dbl. overarm
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½B Vert.
Kempsmith No. 1 Univ.

MISCELLANEOUS

10'x⅜" Niagara Power Squaring Shear 18" Gap, M.D.
Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5½B Hammer
Baker #2 Keyseater 5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
Nateo No. 13 Multiple Spindle Drill
48" Southwork gate shear ½" 24" gap.
8'x½" cap. Kling Bending Rolls
6' Hilles & Jones Roll

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MONA MOTORS
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1⅝" New Britain 6 spindle
4½" Gridley 4-spindle Model H
No. 454 New Britain, 4-spindle chucking
6"x6¾" Goss & DeLeeuw 4 spdl. chucking
14"x19" Fay automatic lathe
15" Sundstrand Automatic lathe
Gisholt Simplimatic

BROACHES

No. 1 Foote Burt hydraulic surface
Twin 10 Oilgear hydraulic
No. 28 Oilgear hydraulic
No. 3 Lapointe double screw
No. 2 Standard screw press

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Sensitive, all makes and types
21" Canedy Otte (New)
20" & 24" Cincinnati upright
20" Barnes box Column mfg.
22" Barnes 2-spindle, all grd., self oiling
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS

No. 12 Barber-Colman hobbers
No. 12 Bar. Col. long bed splining
Nos. 7 and 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & E spur gear cutter
No. 36 BM Gould Eber. 3 spdl. bevel
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason beveltesters and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS

No. 2 Cincinnati centerless
No. 72A3 Heald Sizematic
No. 1 G Greenby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing internal
12"x36", 16"x36" & 16"x72" Landis
6"x20", No. 10 & 6"x32" No. 11 B.&S.
Nos. 1 & 2 Brown & Sharpe Universal
10"x18", 10"x36" & 10"x50" Norton
18", No. 6 Besly opposed disc
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x32" & 16"x72" Landis crankpin
No. 10 Blanchard surface
No. 1½ Cincinnati tool & cutter

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x6' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x8' Boye & Emmes
24"x12" Boye & Emmes
28", No. 3B Foster turret
28" Gisholt turret
8" and 12" Sundstrand Stub
15" Sundstrand automatic stub
14"x18" Monarch Magnamatic
9"x12" Sundstrand grd. hd. Mfg.
42" Bullard New Era U.T.L.

MILLERS & BORING MILLS

2½" Universal horizontal mill
3½" bar Universal horizontal mill
5" Barret cylinder borer
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
No. 2 Cincinnati plain
No. 4—36 Cincinnati Hydromatic
No. 3 Sundstrand bed type mfg. miller
48" Oesterlein tilted offset miller
30" & 42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 4 Lees Bradner univ. thread
4" Rice Barton double spline
No. 6 Whitney hand mill
No. 2 Kent Owens hand

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2—#4 CINCINNATI DIAL TYPE High Speed Sliding Head Vertical Milling Machine, A.C. 15 H.P. Motor and Controls, Serials #4A4V1J/189 and 4A4V1J/175.

1—#4K MILWAUKEE Sliding Head Vertical Milling Machine, A.C. Motor and Controls, Serial #6/3644.

2—#3H MILWAUKEE Sliding Head Vertical Milling Machines, 7½ H.P. A.C. Motors and Controls, Coolant pump and piping, Serial Number 7/3640 & 7/3627.

3—14"x48" LANDIS Type C Plain Hydraulic Cylindrical Grinders, A.C. Motors and Controls. Heavy Duty.

3—12"x36" H.T. Lees Bradner Thread Milling Machines, with A.C. Motors and Controls.

1—Model #1112-C EXCELLO Single Spindle Boring Machines, A.C. Motors and Controls.

The Above Machines All New in 1941 and 1942

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12' NILES-BEMENT-POND Heavy Duty Boring Mill, 2 Heads. PRT. Arranged for Motor drive with D.C. Variable speed motor.

10' CINCINNATI Heavy Duty Vertical Boring Mill, 2 Heads. PRT. Arranged for motor drive.

38"-44" NILES-BEMENT-POND Vertical Turret Lathe, A.C. Motor drive, PRT.

7' AMERICAN Triple Purpose Plain Radial Drill, Fully enclosed head, motor drive.

6' AMERICAN Boilermakers type Plain Radial Drill, motor drive.

LATHES

14"x6' Sebastian Grd. Hd.
14"x6' Bradford Cone, Q.C.
24"x10' Greaves Klusman Grd. Hd. Taper Q.C.
27"x16' Lodge & Shipley Sel. Grd. Hd. Q.C. Taper.
30"x14' Shumaker & Boye Cone, Q.C.
36"x24' American Grd. Hd. 2 Carriages, Q.C.
30"x14' LeBlond Heavy Duty Engine Lathe 3 S.C.D. B.G.

MILLING MACHINES

#2 Brown & Sharpe Plain Cone Drive.
#4 Cincinnati High Power, M.D. PRT.
#3 Cincinnati Vertical H.P. S.P.D.
#5B Becker Vertical A.C. Motor Drive.
#6 Becker Vertical A.C. Motor Drive.
48" Ohio Tilted Offset, Arr. M.D.

GRINDERS

#78 Covel Hanchett Surface M.D.
10"x72" Landis Plain Grinder, M.D.
12"x96" Landis Plain Grinder, S.C.
18"x85" Landis Crankshaft Grinder, M.D.
#60 Heald Internal Cylinder Grinder.
16"x50" Norton Plain Grinder, M.D.

GEAR MACHINERY

6" Gleason Straight Tooth Bevel Gear Generator A.C. M.D.
18" Gleason Straight Tooth Bevel Gear Generator, S.P.D.
#1 Adams Farwell Gear Hobbing Machine.
#3 Adams Farwell Gear Hobbing Machine.
#0 Pfauter Gear Hobbing Machine.
#1 Pfauter Gear Hobbing Machine.
#5R Pfauter Gear Hobbing Machine.
#18H Gould & Eberhardt Gear Hobbing Machine.
#61 Fellows Gear Shaper.

PLANERS

24"x24"x6' Whitcomb Blaisdell Planer, 1 Hd.
24"x24"x10' Powell Planer, 2 Heads, A.C. M.D.
30"x30"x8' Gray Planer, 1 Hd.
60"x48"x26' American Planer, 4 Hds.
60"x60"x14' Cleveland Openside Planer, Box Table 3 Hds. M.D.

RADIALS & DRILLS

New 21" Canedy Otto Upright Sliding Head, A.C. M.D.
21" Royersford Excelsior New, M.D.
6' Cincinnati Bickford A.C. M.D.
6' Cincinnati Bickford A.C. M.D.

MISCELLANEOUS

#9 LeBlond Multicut, A.C. Motor drive.
Seneca Falls LoSwing.
3"x48" LoSwing Lathe.
#3AL Gisholt 6¼" Hole Full Universal Turret Lathe.
3"x36" J & L Turret Lathe, Steel Gears, Arr. M.D.
2¼"x24" J & L Turret Lathe, Bar Work.
#2H-8 Libby Turret Lathe, A.C. Motor Drive.
#2 Rockford Horizontal Drill.
6'x⅛" Robinson Press Brake, B.D.
8'x¾" Initial Type Bending Rolls, B.D.
#4 Noble & Westbrook Marking Machines.
#185 Schmidt Markers.
14" Niles Slotter.
2" Landis Pipe Machine, A.C. M.D.
8" Landis Pipe Machine, Cone Drive.
¾" Geometric Bolt Cutting Machine, S.P.D.
#3A High Speed Riveter, B.D.
½" McCabe Flanging Machine.
#1 Barrett Horizontal Boring Mill, Belt Drive.
24" Coulter Shaper Planer, M.D.
16" Steptoe Crank Shaper, Cone Drive.
24" Hollingsworth Crank Shaper, Cone Drive.

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No. 11 Natco 16 spindle
No. 3 Defiance, s.p.d., #5 Morse Taper
No. 24 Foote-Burt, s.p.d., #4 Morse Taper
24" Barnes Camelback
21" Cincinnati-Bickford, single spindle, m.d.
21" Canedy-Otto Single Spindle, m.d.

GEAR CUTTERS
No. 75 Fellows High Speed Gear Shaper
No. 715A Fellows High Speed Gear Shaper
No. 5—60" Brown & Sharpe
No. 3—26" Brown & Sharpe
No. 5 & 6 Cincinnati
No. 6 Fellows Gear Shaper, m.d.
No. 13 Brown & Sharpe
No. 12 Barber-Colman Hobber
98" Gleason Spur & Bevel Gear Planer
30" Rochester Gear Tooth Rounder

GRINDERS
No. 2 Cincinnati Centerless
No. 16 Blanchard Surface
No. 13 Brown & Sharpe Universal
No. 2 Cincinnati Universal
No. 70 Heald Internal
No. 72A3 Heald Gagematic
No. 65 Heald Cylinder
14"x120" Landis Type C Cylindrical, 4 yrs. old
10"x30" Landis Cylindrical
10"x36" Norton Cylindrical
10"x36" Hill-Clarke Cylindrical
11"x72" Brown & Sharpe Cylindrical
76" Rogers Knife Grinder

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30"x14' LeBlond Hvy. Duty, c.d.
24"x30 Lodge & Shipley, geared hd.
18"x10' Hendey, geared hd.
18"x 8' American, geared hd.
12"x10' American, c.d.
14"x 5' Lodge & Shipley, c.d.
14"x 6' LeBlond, c.d.
14"x10' Lodge & Shipley, c.d.
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No. 2A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h.
2¼"x24" Jones & Lamson, g.h.
26" Libby, g.h.
No. 5A Potter & Johnston, g.h.
No. 6, 4 & 2 Warner & Swasey
42" Bullard New Era V.T.L.

MILLS
No. 3 Milwaukee Universal, m.d.
No. 2B Milwaukee Universal, m.d.
No. 2 Milwaukee Plain, m.d.
No. 1½A Rockford Plain, c.d.
No. 2 Milwaukee Vertical, m.d.
No. 2½B Milwaukee Vertical, s.p.d.
No. 5 Becker Vertical, c.d.
No. 0-8 Cincinnati Vertical
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4" Pratt & Whitney Spline

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6" & 12" Williams Pipe Machine
4" Stevens Vertical Slotter
16" Betts Vertical Slotter
Kane & Roach Roll Forming Machine

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6" Pratt & Whitney Vertical Shaper
60"x60"x14' Cleveland Openside, 3 hds.
36"x36"x12' Woodward & Powell, 2 hds.
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24"x24"x 8' American Planer, 1 head

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#2 SIMMONS, M.D. (1941)

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36"x20' N-B-P geared head M.D.

24"x14' WHITCOMB, Q.C., D.B.G. taper

20"x6' AMERICAN, D.B.G. motorized

16"x8' AMERICAN geared head, taper att.

16"x6' MONARCH geared head M.D.

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3" Universal, horizontal, modern, M.D.

42" BULLARD, vertical turret, M.D.

36" BAUSCH, vertical, Q.C., M.D.

24" BULLARD, vertical turret, M.D.

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#OY BROWN & SHARPE, plain, M.D.

PLANERS

48"x48"x19' D & H, openside, 3 hds.

36"x36"x12' CINCINNATI, 3 heads

GRINDERS

14" PRATT & WHITNEY, vertical surface, B.B., M.D.

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#5 GRAND RAPIDS tool & cutter, M. in base

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LODGE & SHIPLEY 30"x26'—2 carriages
MOREY #3 Univ. Turret—1½" cap.
WARNER & SWASEY #3A Univ. Turret

MILLERS
BROWN & SHARPE #3A Univ.
KEARNEY & TRECKER #3B Univ.
CINCINNATI #3 Vert.
BROWN & SHARPE #3 VERT.
MOREY #12M—2 spindle Vert. Miller and Profiler
MOREY 12" x 60" Thread Miller
RICE BARTON 4" Duplex Spline Miller
INGERSOLL 48"x48"x16' Adj. Rail—4 swivel heads

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GRAY 24"x24"x6'—1 head
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PRATT & WHITNEY 6" and 10" vert.
MORTON 30" Draw Cut—Horiz.

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SAUNDERS 8-18" Pipe Machine
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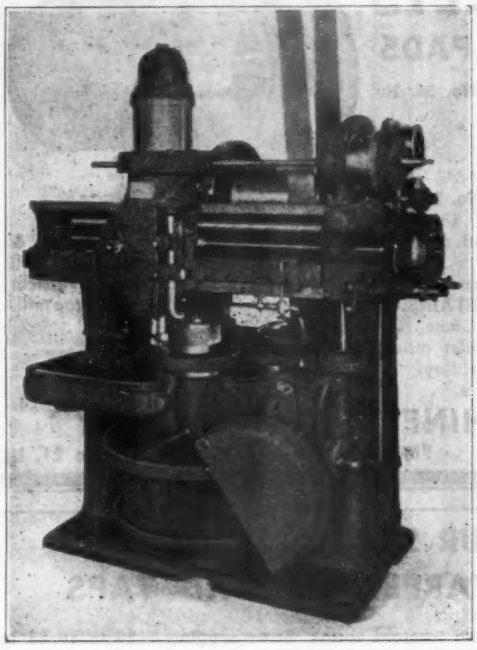

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15" GLEASON—Bevel Gear
NO. 36-ST GOULD & EBERHARDT —Multiple
NO. 36-BM GOULD & EBERHARDT —Multiple Spindle Bevel

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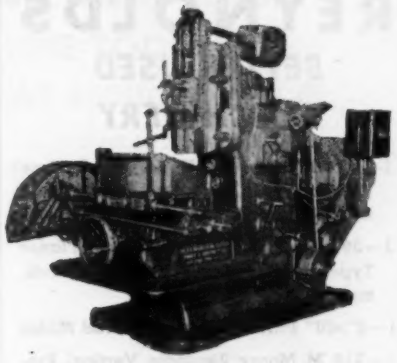

14"x7" MAAG GEAR SHAPER

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PRATT & WHITNEY—Tooth

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15" GLEASON—Finisher
15" GLEASON—Bevel Finisher
18" GLEASON—Bevel

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NO. 40 CROSS—Hydraulic
CROSS—Double Head

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4" Bar Lucas Horizontal Boring Mill, M.D.
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Planing & Boring Machine

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Gear cutter, Gould & Eberhardt 42"
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Shaper, 16" Barker
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36"x36"x16' Gray Planer, 2 heads, M.D.
Gridley Model H, 4-spindle Chucking Machines, M.D.

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BETTER USED MACHINERY

1—10"x36" Norton Hydraulic Surface Grinder, 7½ HP Motor Drive, Magnetic Chuck 10"x36". New 1941

1—36" W x 24" H x 10' Ingersoll Planer Type Miller 4 heads; adjustable rail, motor drive

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1—#12 M Morey 2-spindle Vertical Profiler, M. D.; New 1941

1—#34 Abrasive Vertical Spindle Surface Grinder; 24"x8"x12" h. New September 1943

1—#10 Brown & Sharpe Plain Miller; Motor Driven; Electric Control Type; New about 1941

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1—#16 Blanchard Vertical Spindle Rotary Surface Grinder—30" magnetic chuck, 25 H.P. Motor, 220-3-60 on spindle.

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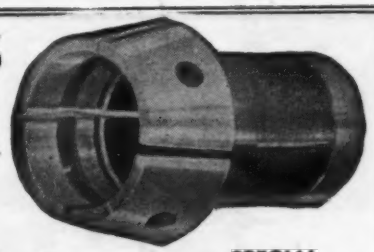

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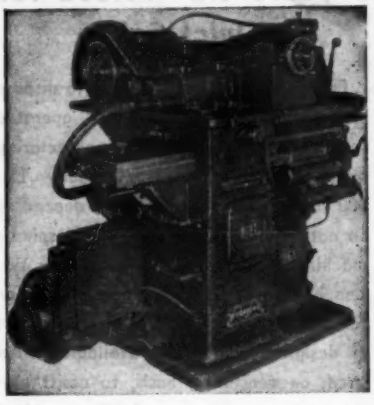

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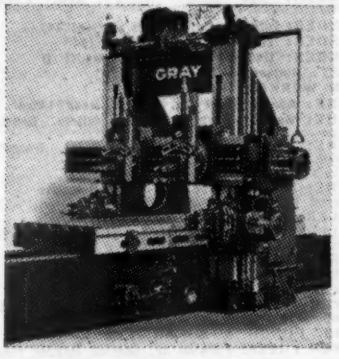

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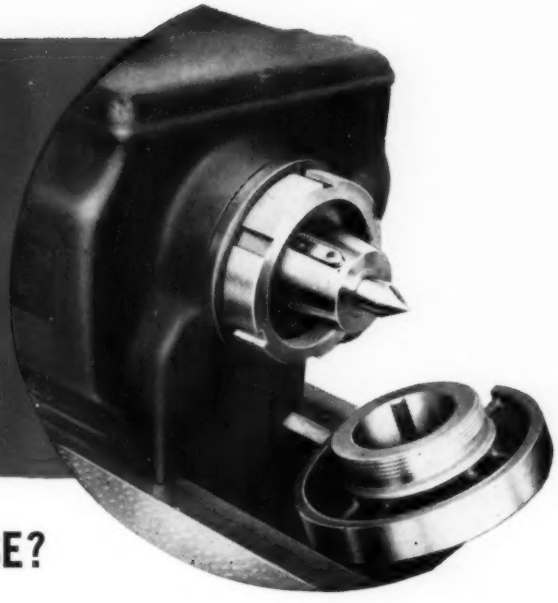

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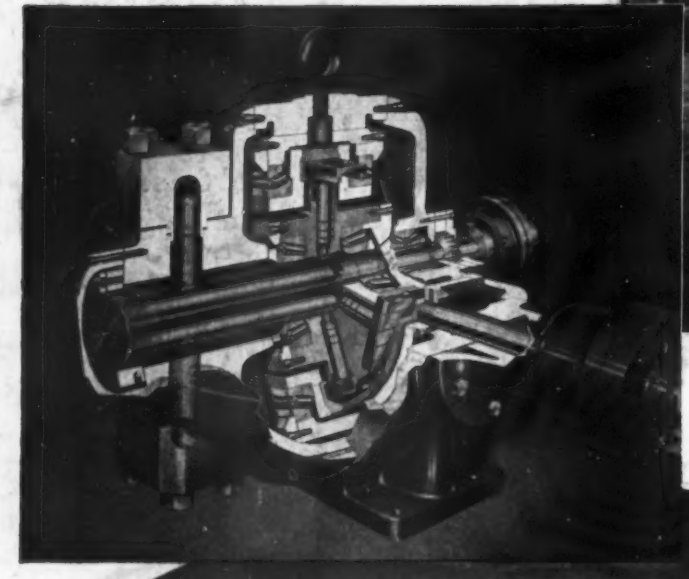

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